EXPORT NUMBER

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ADVERTISING INDEX—PAGE 164.

CANADIAN MACHINERY AND MANUFACTURING NEWS

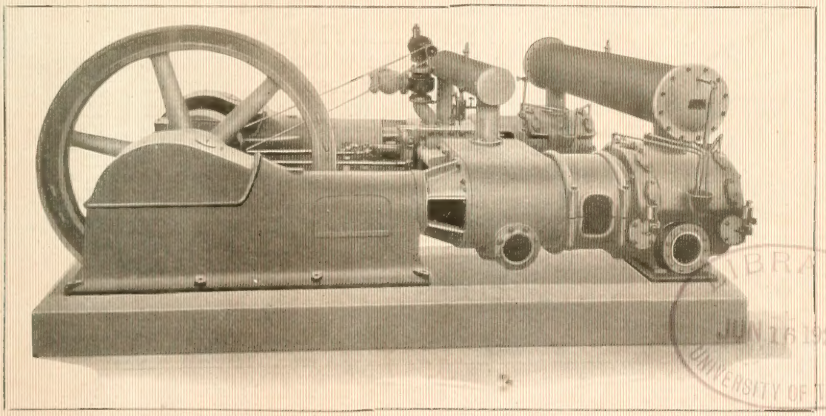
The Maclean Publishing Company, Limited, Toronto, Montreal, Winnipeg, New York, Chicago, Boston, and London, Eng.

Vol. XVIII—No. 18 Publication Office: Toronto, November 1, 1917 Subscription Price $3.00 per Year

JENCKES

Duplex Cross Compound Air Compressor

It has Corliss Inlet Valves, Disc Outlet Valves, enclosed and dust proof frame, minimizing wear, Flood Lubrication system, and bearings are extra large.



LIBRARY JUN 16 1922 UNIVERSITY OF TORONTO

The type illustrated is Duplex, Cross Compound Meyer Steam Driven, two stage Corliss Air Compressor. Air Compressors of the type shown in the cut are built by us in sizes ranging from 445 to 6150 cubic feet displacement per minute

Let us know your requirements, and quotation will be promptly sent for the size best suited for your conditions.

The Jenckes Machine Company, Limited

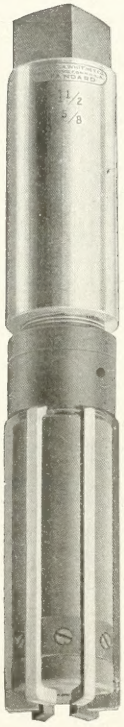
WORKS: Sherbrooke, Que.

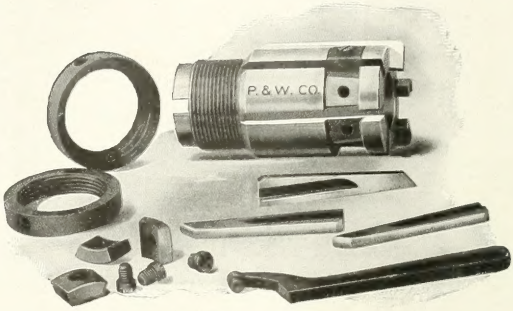
CANADIAN SALES OFFICES: Sherbrooke, Montreal, Toronto, St. Catharines, Cobalt, Vancouver

WORKS: St. Catharines, Ont

SMALL TOOLS

P. & W. Adjustable BLADE REAMERS





These reamers have eccentric relief and can be set to size without regrinding. They are unexcelled for design and simplicity and ease of adjustment. The eccentrically relieved blades are stronger than others, do not chatter, and produce a smoother hole. The hand, shell and fluted chucking reamers have interchangeable nuts, screws and wrenches. The bottom of a hole can readily be faced. By a simple adjustment of the blades the reamers can easily be set to size without regrinding.

PROMPT SERVICE

is assured at our nearest store, where P. & W. Small Tools are carried in stock. Place your order there to-day.

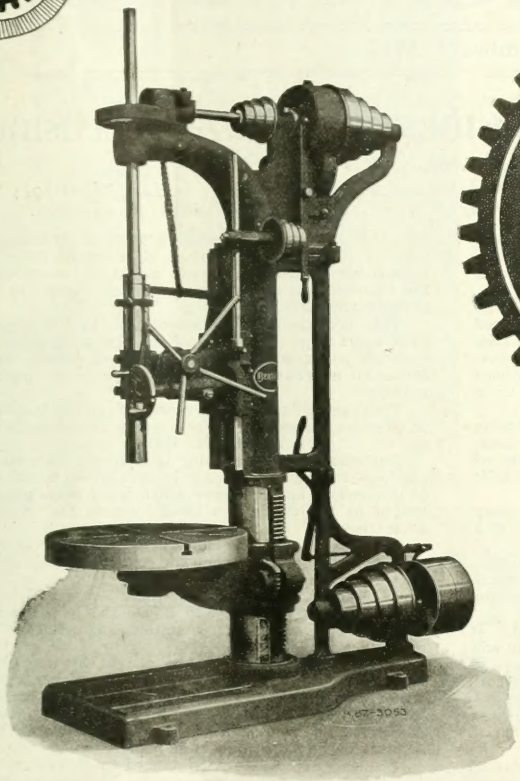
Precision Machine Tools Standards and Gauges

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.



Bertram MACHINE TOOLS

Locomotive and Car Shop Equipment

Structural and Bridge Shop Machinery

Repair Shop Machinery

General Machine Shop Equipment

30-Inch Vertical Drilling Machine

Photographs and full particulars gladly mailed upon request.

WRITE US NOW

We'll be pleased to submit photographs and full details on any line or lines in which you are interested.

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Publisher's Page

TORONTO November 1, 1917

The Economy of Business Paper Advertising

By H. E. CLELAND, NEW YORK

Awarded the Higham prize at the convention of Associated Advertising Clubs, at St. Louis, June 1917. This prize is given annually to the one delivering the most constructive address in the fewest words.

ECONOMY is a many sided question and may mean anything up to the threshold of total abstinence. But Webster tagged it best when he said it means "a judicious expenditure of money."

War is shoving economy of this kind into the spotlight, thereby proving that war is not all battles, blood and what Sherman said it was. War has its good side. It has upset a centuries-old and centuries-rotten despotism. It has whipped British manufacturing methods into a state of high efficiency. It has waked up a snoring America.

In these conditions there's room for the advertising man, whether he be publisher, agent, salesman or user, who persists in dressing advertising in garments of glittering guff. It must be stripped to its effective self; made ready to fight, not to pose.

In brief, advertising must now line up with every other business and make every dollar spent for it a "judicious expenditure of money."

The business press of the country welcomes this return to the fundamentals, for with this attitude must come a full appreciation of the effective economy of business paper advertising.

Business paper advertising has never posed. It never has been nor will be surrounded by the pomp and circumstance of enormous circulation. It cannot hope to fly the banner of tremendous rates. The average cost per page is so low that it doesn't sound respectable.

In short, business paper advertising is not the bass drum of this band. It doesn't make the noise—but it carries the tune, clear and true.

We assert for it a very high efficiency per dollar of cost. And that, we believe, is the aim—and rightfully the aim—of every straight-thinking advertising man.

THE REASONS WHY

And these are the reasons why it is effective.

First, the editorial character of each paper limits the circulation to those men in an industry or trade who are responsible for results. These are the men who actually buy or recommend the buying of the machinery or merchandise advertised in the paper. Therefore, waste circulation practically does not exist and is in every event cut to the bone. Hence, at the very beginning we strike at effective advertising's greatest extravagance, waste circulation, and put in its place intensive circulation.

Second, the buying power per subscriber represents an infinitely greater sum than the buying power per subscriber of any other class of publication because each buyer purchases for business and not private consumption.

Third, the editorial contents of the paper are in harmony with the advertising pages. The first tells a man "how" and the second shows "what with." To borrow the simile of a colleague of mine, the whole paper may be regarded as an enormous advertisement with the editorial pages carrying the educational copy and the advertising pages representing the return coupon.

In a recent investigation as to the effectiveness of advertising run next to reading matter and advertising which was segregated, it was demonstrated that when the reading matter next to the advertisement was germane to the product advertised, then results from the advertising were far and away ahead of results when the reading matter was on a subject foreign to the product advertised.

This investigation was carried on in the general field, but I regard it as one of the best arguments for business paper advertising I have ever heard. In a sense, all advertising in a business paper is "next to reading."

Those three fundamental reasons form the backbone of effective economy in advertising and sum up thus:—

THE CONCLUSIONS

Business paper advertising is economical because it reaches—and the advertiser only pays for—a circulation of tremendous buying power which is continually being taught by the publication itself to want the products advertised.

The business of the business papers is to exert a wise and wide influence upon the commercial and industrial development of the country.

We cannot surround them with flowers and furbelows, nor is it necessary to allure the non-technical, non-trade man with pictures of Gertie Coughdrop, "the film's flossiest flapper."

Our readers are not to be caught by any cheap expedients. And those editors and advertising writers who find it necessary to mount their untamed vocabularies, jab them a couple of times with their favorite adjectives, and ride off in a ribald revel of words, have no place in the modern business publication.

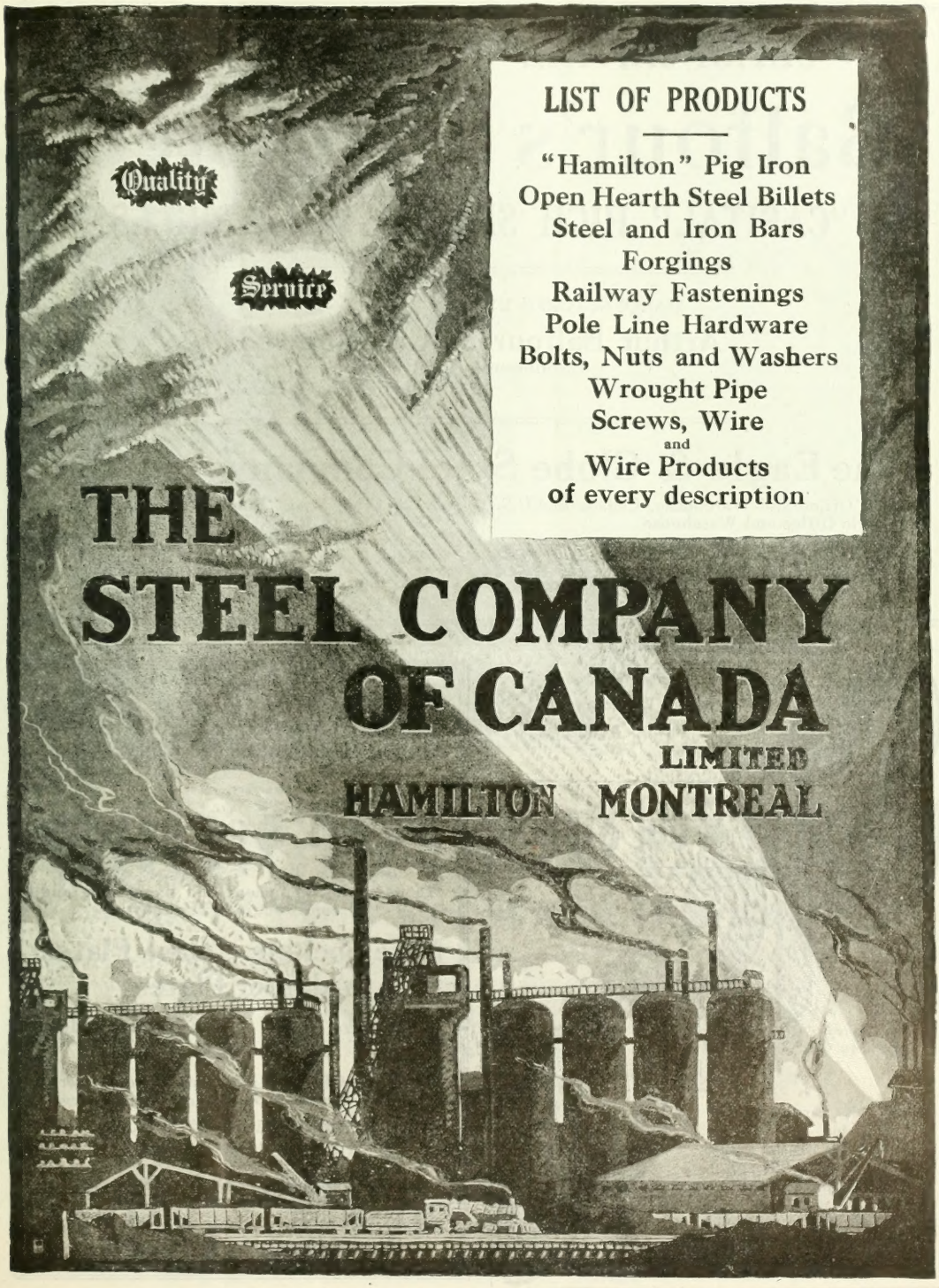
Business papers are not intended to amuse, are not intended for the tired business men. They touch men—and men only—on that side of their lives which occupies most of their wakeful hours. They instruct, lead, guide and help men to do things, to build things and to sell things. They are for the world's doers when they are in the midst of doing.

In one of Mark Sullivan's editorials in Collier's he says:—

> "Progress is no monopoly of the cannon makers. In one issue of the 'Electrical World' we note that the Columbus (Ohio) Railway, Power & Light Company has set out to make its buildings safer. Fire escapes, standard doors, and other improvements have been added along with a rigid system of inspection to prevent the accumulation of waste and grease, so that in three years fire risks and insurance rates have been cut nearly in half. In Johnston, S.C., F. M. Boyd, manager for the Carolina Public Service Company, has devised a new type of twenty-five-foot pole with a twelve-foot mast-arm sticking out on the street side so as to keep the poles lined up on the curb but get the wires away from the beautiful old elms and water oaks that are the glory of Johnston's highways. Anyone who has seen the ruin and mutilation left by fanatical tree trimmers will appreciate Mr. Boyd's device. The Ohio Electric Light Association reports that its members have saved from three to five cents per ton on all coal handled at certain of their power houses by putting in an eight-hour day for firemen. This ought to interest the old-timers who think twelve hours' toil an inalienable right for engine-room workers. Those three items cover vital subjects and are only part of the grist in one issue of a live technical journal. That's how our United States goes along."

Those of you who know Collier's know that this comment is from an authority whose point of observation is a long way from the bull pen.

(Continued next week.)



If any advertisement interests you, tear it out now and place with letters to be answered.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S.
Ontario Office and Warehouse
Winnipeg Stock
Vancouver Stock
128 Craig Street West, Montreal
36 Colborne Street, Toronto
Dominion Equipment & Supply Co. Limited
Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

James McKay Company

Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

WHERE A

BRIDGEFORD LATHE

Saved 14½ Hours on a 21 Hour Job

Some time ago we furnished J. H. Horne, Sons & Company, Lawrence, Mass., estimates of what a Bridgeford Lathe could do on big textile machine spindles. The figures looked good and we sold them this 32″ x 28′ machine. The spindles come to the lathe as castings from which considerable stock must be removed. There is a long taper and two or three irregular sections as well as straight portions to be turned. While the spindles vary in size and shape, an average job by former methods meant 21 hours of good hard work, including handling time and turning time. The first spindle put up to the newly installed "Bridgeford" came off the lathe in 6½ hours. And that is a good example of the Bridgeford pace.

Bridgeford Lathes are rigid, accurate machines, adapted for turning heavy rolls, big shafts, massive pinions and similar work, machines capable of pulling any cut the best high speed steel tools will take.

The harder the work, the stiffer the pace, the more you need Bridgeford Lathes.
Shall we send you our catalogue?

BRIDGEFORD MACHINE TOOL WORKS

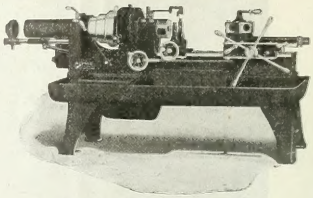
161 WINTON ROAD — MANUFACTURERS FOR HEAVY DUTY LATHES FOR MORE THAN 20 YEARS — ROCHESTER, N.Y.

Accurate Work is easily produced on a Cincinnati Acme

IN the first place, Cincinnati Acme Machines have head and bed cast solid, insuring permanent and positive alignment of the spindle with the ways of the bed.

Secondly, the automatic chuck is forged solid on the spindle; dirt and chips cannot therefore work in and destroy the accuracy of this chuck.

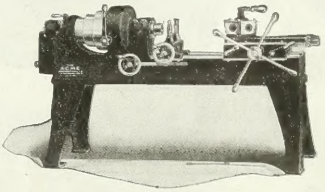
And in the third place, adjustable taper gibs provide for taking up wear in the slide and saddle.



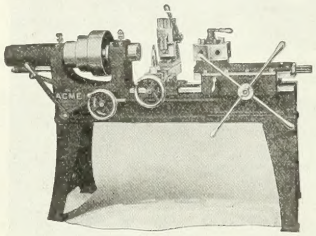
2¼-in. x 11-in. Screw Machine

In addition to their accuracy, Cincinnati Acme Machines are noted for their productiveness and ability to stand up under severe strains.

Our Catalogue explains in detail many more valuable features of Cincinnati Acme Machines. Catalogue upon request.



18-in. Turret Lathe

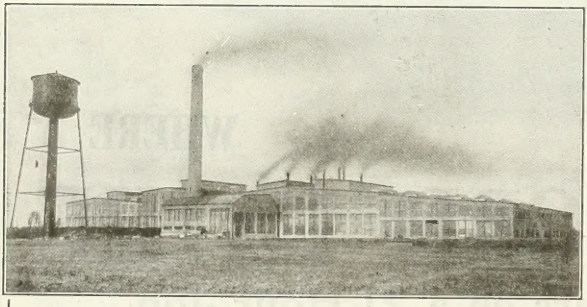


16-in. Forming Turret Lathe

The Acme Machine Tool Company

CINCINNATI, OHIO, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co., Montreal, Toronto



Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

Carried in Stock

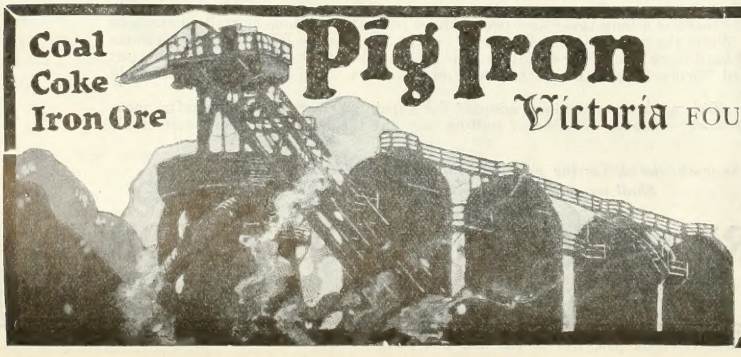
CARBON AND ALLOY STEELS

Shop Tools, Gauges, etc.

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore



Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:

703 C.P.R. Bldg., Toronto

Steel Castings

Our lengthy and varied experience in making Manganese, Vanadium, Titanium castings assures you of getting the best of products.

Anything in castings from 1 lb. to 50 tons is right in our line. Ships' castings our specialty.

Castings made true to specifications and patterns.

Propeller shaft Bearing for Ice-Breaker "John D Hazen."

Canadian Steel Foundries
Limited

GENERAL OFFICE: Transportation Bldg., Montreal, Canada.

LONDON (England) OFFICE: Trafalgar House, Waterloo Place

WORKS: Welland, Ont.; Point St. Charles, Montreal; Longue Pointe, Montreal.

Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

Hyde Engineering Works
27 William St., Montreal

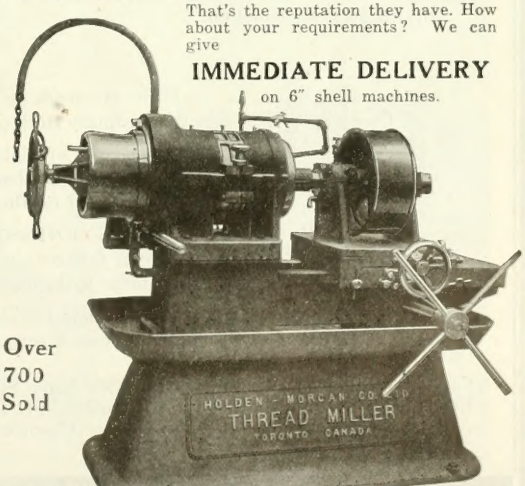
P.O. Box 1185
Telephones: M. 1899 & M. 2527

70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY
on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.
W. FRONT ST. (Limited) TORONTO

THE JOHNSON FRICTION CLUTCH

DOUBLE TYPE

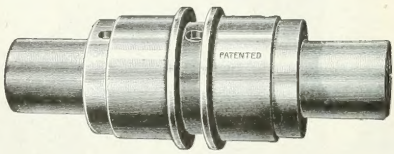


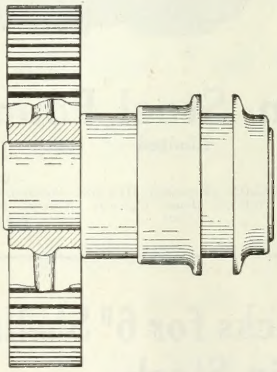
Fig. 4D
Double Clutch Exterior

The double clutch requires but little more space than the single, and has two friction cups with hubs, on which can be mounted pulleys, cones, gears, sprockets, etc., of any diameter and face.

The double clutches are constructed on the same principle as the single clutches, and have the same general characteristics.

For countershafts, the advantages of JOHNSON FRICTION CLUTCHES are obvious. They operate smoothly at any speed, without bang or clatter, have no projections to catch anything, thus avoiding accidents so common with the ordinary clutches, and save space by their compactness.

By using a double clutch on the countershaft, as illustrated, Fig. 5D, with two pulleys, one with an open belt and one with a crossed belt, any machine can be run forward or reverse. This arrangement is especially desirable in running all machines requiring a reverse motion.



Gear Mounted on Clutch Hub

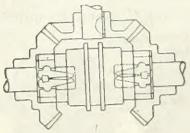


Fig. 6D
Clutch in Nest of Gearing
Johnson Double Friction Clutch incorporated in Bevel Gearing.

Hubs are made to suit requirements as to diameter and length, so that ordinary stock pulleys can be used.

The advent of high-speed steel demands better and more powerful clutches on countershafts. The JOHNSON FRICTION CLUTCH is highly endorsed for this purpose and is being widely adopted.

DOUBLE JOHNSON CLUTCHES can be used in nests of gearing in place of positive clutches, in order to obtain more flexibility at any point and to make operating easier.

Send for our Booklet, "Clutches as applied in Machine Building" and yellow data sheets.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

OUR GOVERNMENT will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed. Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

"Red Cut Superior"

The Nationally Known
First Quality

HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—no space no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced.

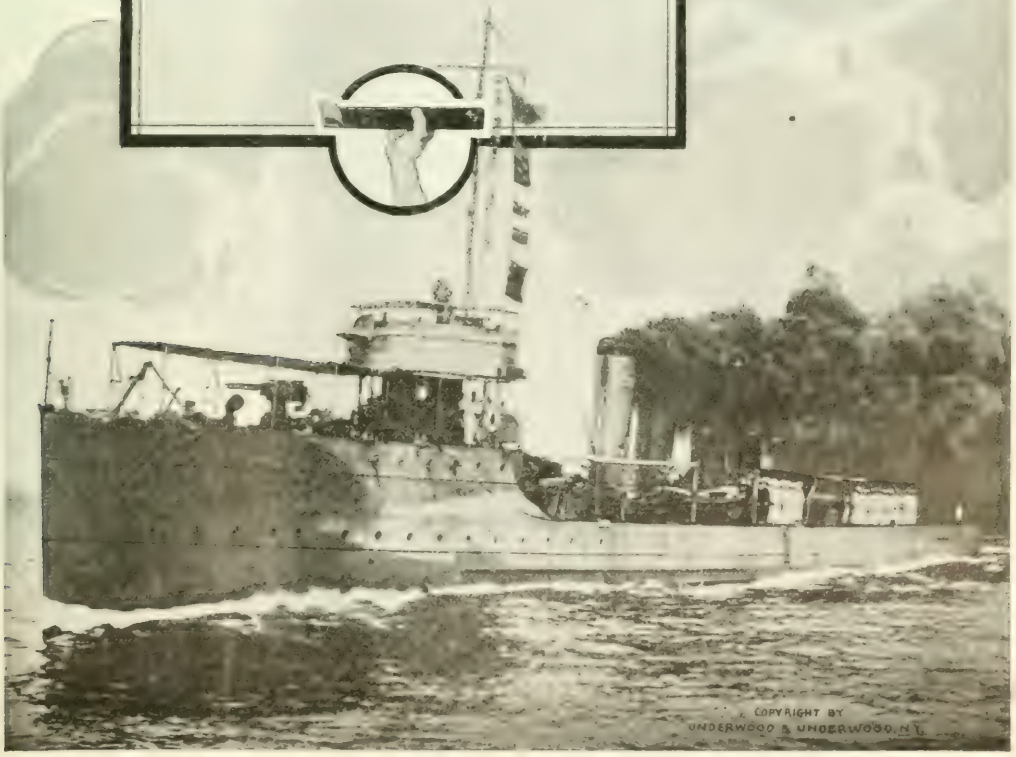
It's best for all machine work

VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA. Works at LATROBE, PA.

U. S. S. Warrington, torpedo boat destroyer, the type of vessel that safely escorted Major General Pershing and his staff to England.

This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare.

Passed by the Censor



COPYRIGHT BY
UNDERWOOD & UNDERWOOD, N.Y.

If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for our mailing list.

The Ford-Smith Machine Company

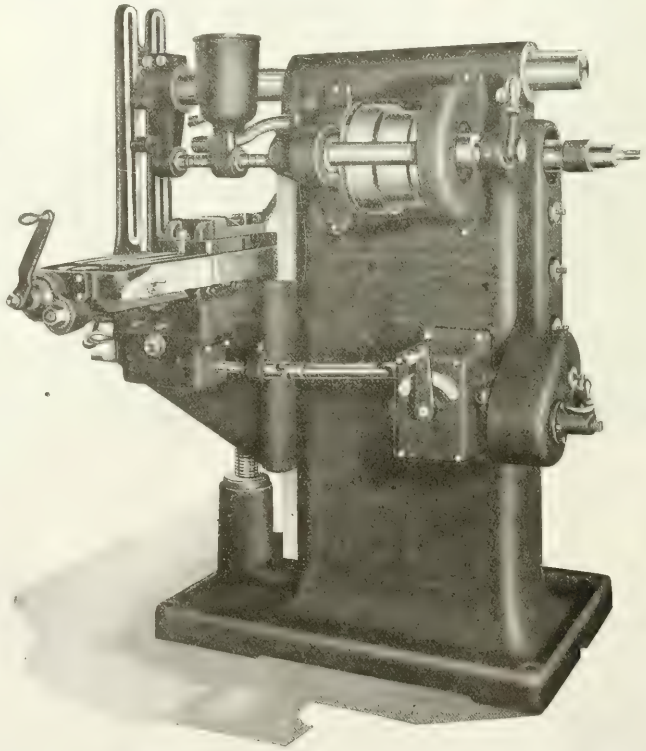
Adv't. No. 7 MILLER SERIES

OUR STAFF:

We promised last issue to speak of our staff. First let us say that our whole organization, including the majority of our men are Machine Tool men only, and by their efforts we produce Millers that mark a high notch in Machine Tool manufacture. Purchasers will find the good workmanship is not merely on the surface—but that the Quality goes clear through.

No. 2 Plain
27" x 19 x 7½

No. 3 Plain
34" x 20" x 10



No. 2 Universal
25" x 18" x 8

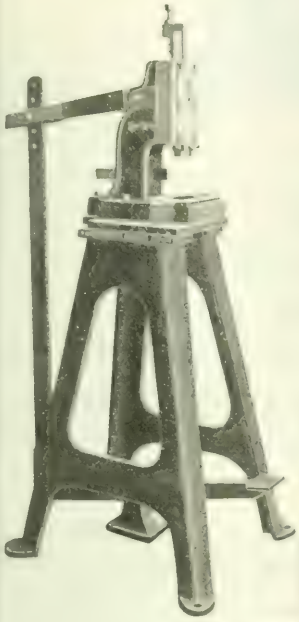
No. 3 Universal
34" x 19" x 10

We don't wish to bother you with letters, spouting about our business, but we sure would like to see a copy of our Catalog and Bulletin on your desk. It would pay you. A postcard will accomplish the result.

Are you acquainted with the fact that we can usually supply direct from stock Plain or Universal Dividing Heads, also various time-saving fixtures for use in conjunction with our MILLERS.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

WHY A "B. B.?"

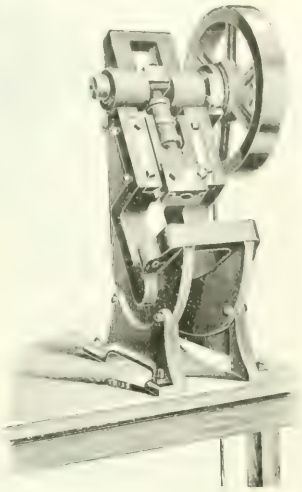


Experience has proved
that

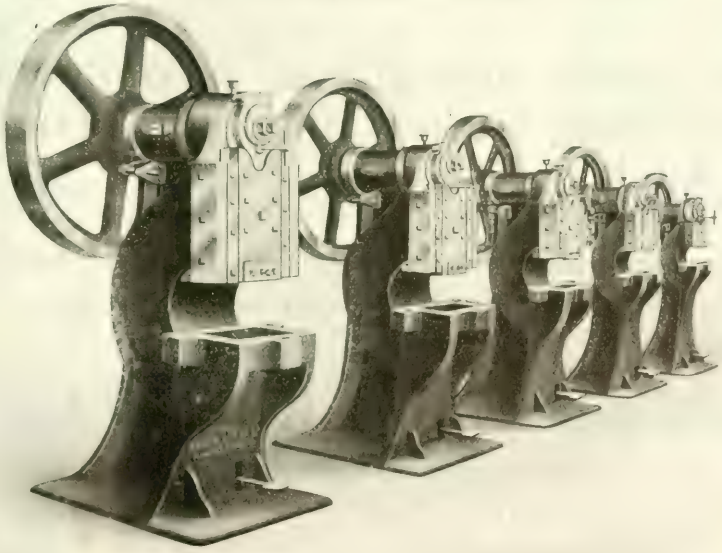
B.B. PRESSES

qualify for

Economy
Durability
Speed



The Brown, Boggs Co.,
LIMITED
HAMILTON, ONT., CANADA



If any advertisement interests you, tear it out now and place with letters to be answered.

QUITE remarkable economies have been effected in turning, planing and shaper work on all kinds of steel, cast iron, bronze and other materials by the new alloy

STELLITE

But we are now able to recommend it for Milling Cutters and Form Tools of all kinds.

Information and quotations supplied by our Service Department on application.

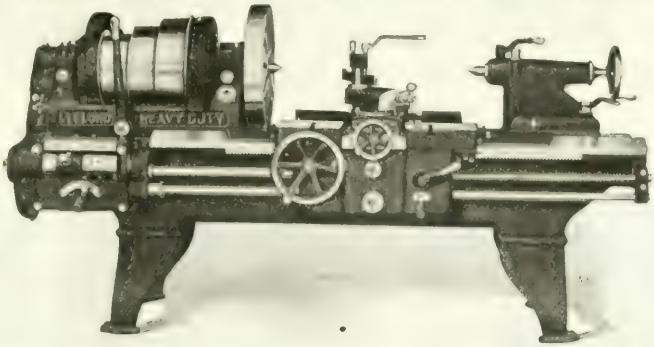
Deloro Smelting & Refining Co. Ltd.

Head Office & Works—Deloro, Ont.

TORONTO
200 King St. W.

MONTREAL
315 Craig St. W.

LEBLOND HEAVY DUTY LATHES



Are lathes built for a definite service. And this a class of Production to which only LeBlond Heavy Duty Lathes are adapted.

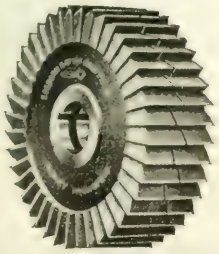
There's a reason
Hardened Spindle Bearings—
One-piece, box section, aprons—
Patent Compensating Vee Bed Design—
Double Friction Back Gears—
and LeBlond Workmanship *do add to the continuous productive life of a lathe.*

The R. K. LeBlond Machine Tool Co.
Cincinnati, Ohio, U.S.A.
Agents in Principal Cities

DOUBLE
MUSHET
High Speed Steel

Carbon Steel
Gauge Steel
Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



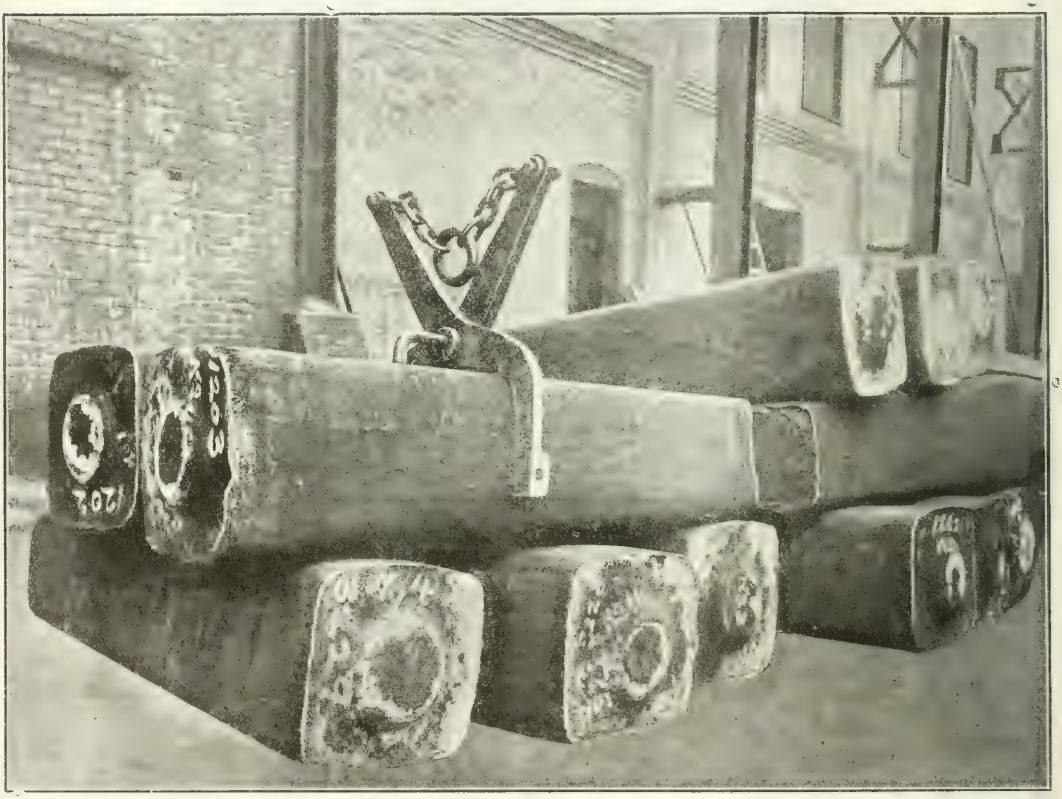
Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

Nova Scotia Steel & Coal Company

Limited

New Glasgow, Nova Scotia, Canada



THREE AND ONE-HALF AND FIVE-TON "FLUID COMPRESSED" STEEL INGOTS.

The Nova Scotia Steel & Coal Co., realizing the importance of "fluid compression" as a valuable aid in producing reliable and first-class steel products, procured by purchase the Canadian license from M. Harmet, of St. Etienne, France, whereby they own the sole rights in this Country to use his process. This they considered in accordance with their policy of taking advantage of every important metallurgical development, thus advancing with modern progress, and particularly that their high reputation as manufacturers of the best marine, railway and machine forgings obtainable should be maintained.

The "fluid compression" plant laid down at Sydney Mines, N.S., consists of one group of four Harmet presses, each of 1,250 tons and capacity to handle 3½ to 5-ton ingots; and one of 4,000 tons to handle ingots up to 30 tons.

The product of this process is used in the manufacture of high-grade forgings, such as locomotive axles, crank shafts, marine forgings, artillery tubes and armor plate of the highest grade; in fact for all commodities in which maximum reliability and homogeneity of structure enter and are demanded.

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK

For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

If any advertisement interests you, tear it out now and place with letters to be answered.

One of the

Steels of the Century

Centurion High-Speed

Made from the **BEST** Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the **BEST** Process

The Crucible Furnace Method

Handled by the **BEST** Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the **BEST** Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

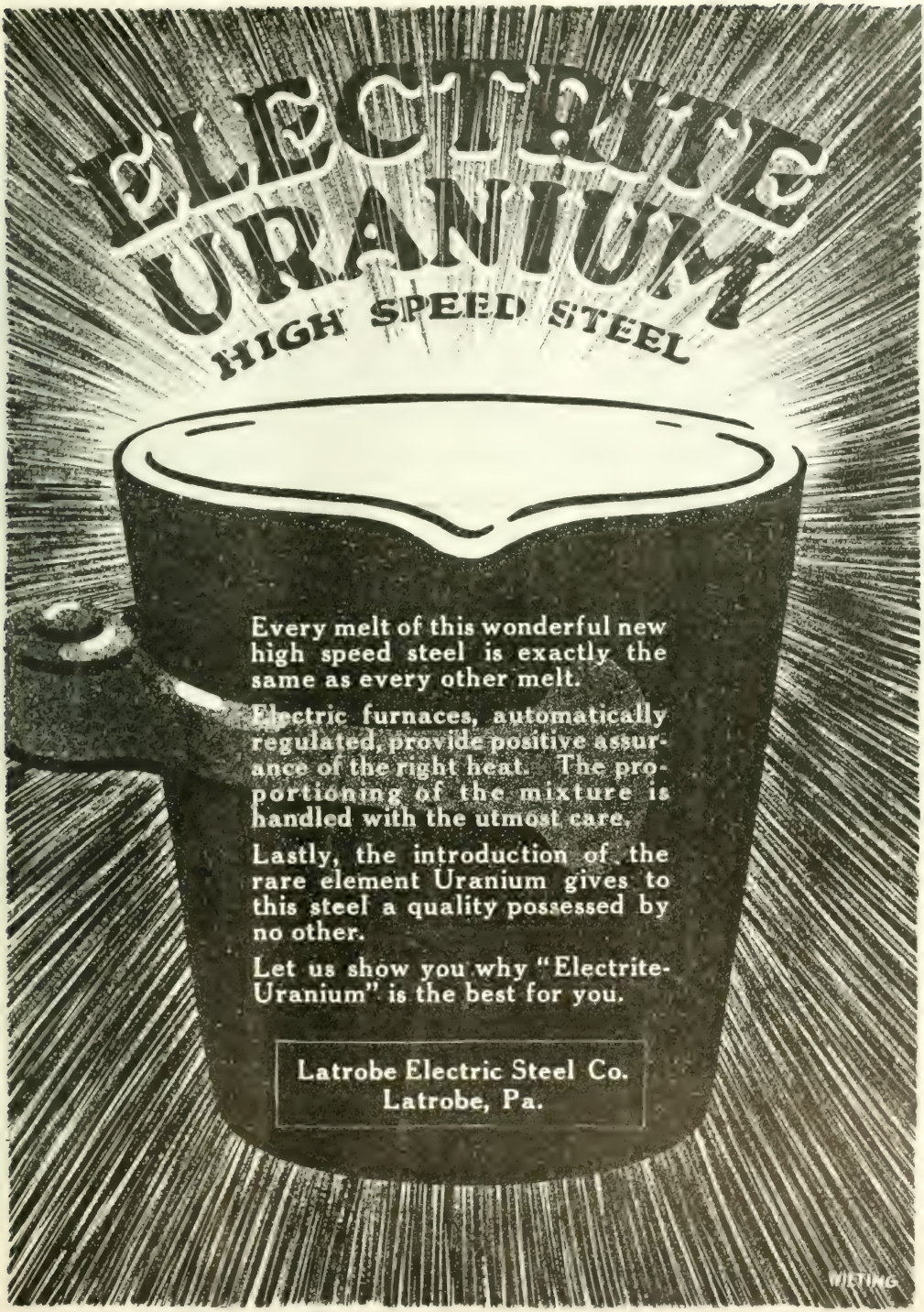
THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE,
N.Y.

Sales Offices:
120 BROADWAY,
NEW YORK

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.


ELECTRITE
URANIUM
HIGH SPEED STEEL
Every melt of this wonderful new high speed steel is exactly the same as every other melt.
Electric furnaces, automatically regulated, provide positive assurance of the right heat. The proportioning of the mixture is handled with the utmost care.
Lastly, the introduction of the rare element Uranium gives to this steel a quality possessed by no other.
Let us show you why "Electrite-Uranium" is the best for you.
Latrobe Electric Steel Co.
Latrobe, Pa.
MELTING

UNIFORMITY

USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL TENAXAS DURASTIC TIN-TOUGHENED
ADAMUS ATLAS MASCOT W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. TORONTO: 86 Richmond Street East.

FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

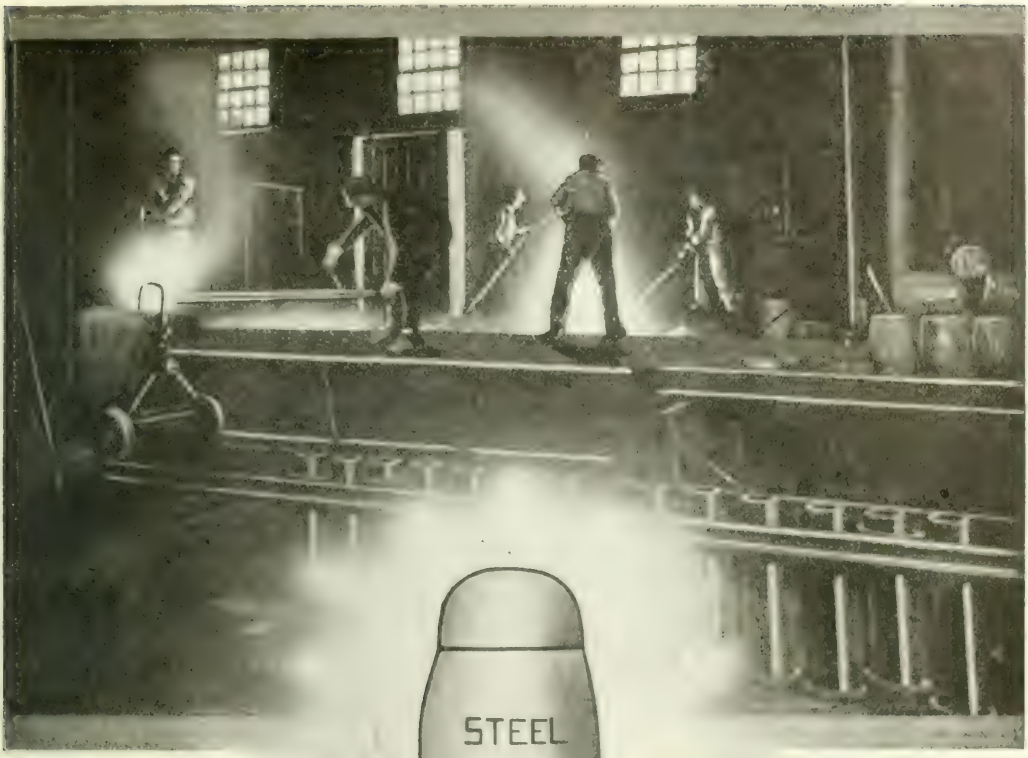
IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.



WOLFRAM
HIGH SPEED STEEL

is of uniform high quality and may be worked down to the last ounce without variation. Wolfram is ready for prompt delivery.

Vulcan Crucible Steel Company

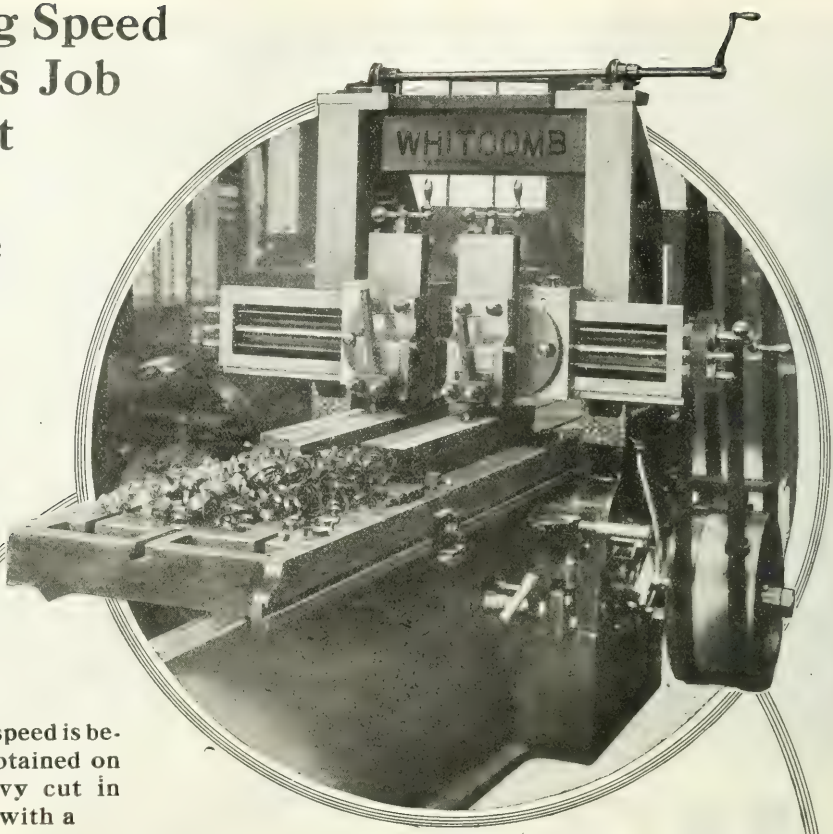
ALIQUIPPA *Established 1900* PA., U.S.A.

Makers of Wolfram High Speed Steel

Represented in Canada by Messrs Norton, Callard & Co., Herald Bldg., Montreal

If any advertisement interests you, tear it out now and place with letters to be answered.

Cutting Speed on This Job 70 Feet Per Minute



That speed is being obtained on a heavy cut in steel, with a

Whitcomb-Blaisdell Planer

The Planer with the Second-Belt Drive

The smooth, easy action and rapid, yet gentle, reverse required for such rapid cutting rates is secured by the distinctive table-drive of the Whitcomb-Blaisdell Planer.

There are many other Whitcomb-Blaisdell Planers operating at similar high speeds in steel. In numerous cases they are planing brass, copper and other soft materials at one hundred feet per minute.

The Second-Belt Drive—using a belt and pulley to convey power from the pulley shaft to the drive-pinion shaft—eliminates the usual bull wheel and the rapid running train of gears.

On the Whitcomb-Blaisdell Planer, the table is given a smooth, quiet, yet powerful drive. At the end of the stroke the belt transmission acts with a cushion effect and the planer reverses without shock or jar, yet with the utmost speed.

That is one reason why this machine attains the highest speeds without impairing the accuracy or finish of the work.

Write for Illustrated Catalog that tells all about it.
The big features of this machine will be of interest.

WHITCOMB-BLAISDELL
MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

LATHES PLANERS

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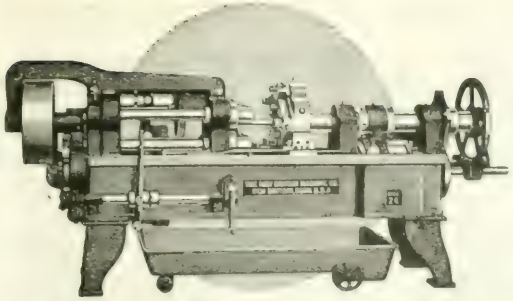


NEW BRITAIN

Let Machine Power Make Good Your Loss of Man Power

WHAT measures are you adopting to meet the steady drain which the military draft will put upon your working force?

How will you maintain your output—to say nothing of increasing it?

Can you readily replace the men who leave? Not without some other manufacturer suffering a loss.

Can you hope for a sufficiently greater individual efficiency from those who remain? Hardly, with the same facilities. What, then, is the solution for this perplexing problem?

The solution—if there is one—lies in the direction of improved processes and more efficient machinery.

Naturally, first and most careful consideration should be given to the field presenting the greatest possibilities for increasing output while saving labor.

IN no section of the machine shop are the opportunities for effecting economies so great as on bar and chuck work.

The "NEW BRITAIN" Six-Spindle Automatic Screw Machine's greater tooling capacity enables it to produce 50% to 200% greater output than is possible with machines of older type.

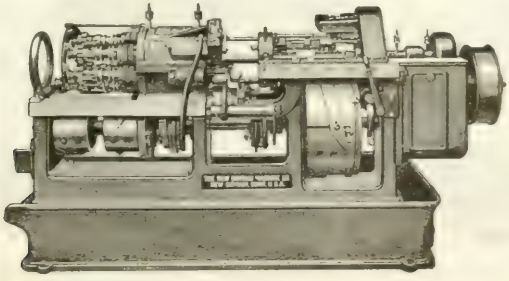
While "NEW BRITAIN" Multiple-Spindle Automatic Chucking Machines, by performing all operations simultaneously—in some cases, finishing both ends at once—are able to chuck castings, forgings, and second-operation bar work 300% to 500% faster than other machines designed for a similar purpose.

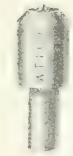
Let us give you production estimates for handling your work "The New Britain Way," for comparison with output you are now obtaining. Send samples or blueprints.

THE NEW BRITAIN MACHINE COMPANY

NEW BRITAIN, CONN., U.S.A.

AUTOMATICS





DIAMONDS

LANDIS NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

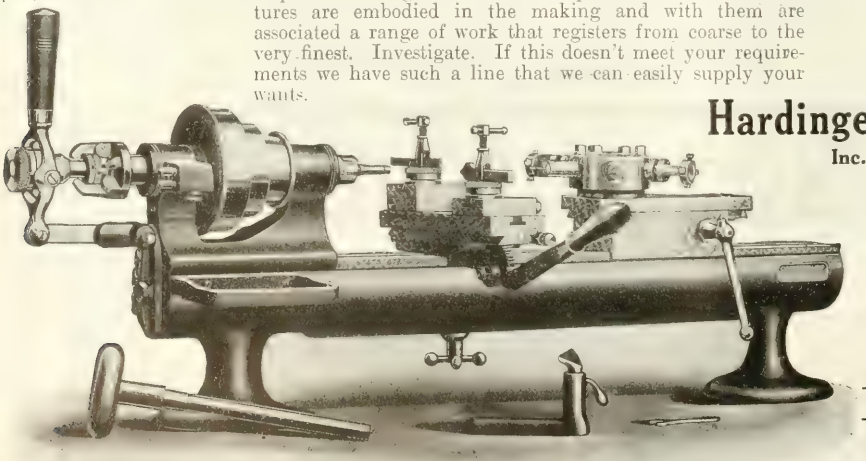
"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.
Inc.
1770 Berteau Avenue,
CHICAGO, ILL., U.S.A.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.

SIDNEY for SERVICE

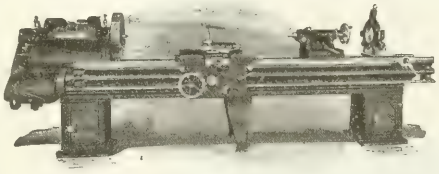
Lathes help turn the WORLD

Modern tools "turn the world." The automatic and swift production of wonderful machines is due to the genius of men who have perfected metal-working tools and machines.

"Sidney for Service" Lathes are doing "their best" to serve the manufacturers of Canada and the United States in an effort to raise production several additional notches. Put SIDNEYS on the job —and watch production climb!

Write a letter for Bulletin 30.

SIDNEY TOOL COMPANY - SIDNEY, OHIO, U.S.A.



Represented in Canada by

FOSS & HILL MACHINERY CO.
MONTREAL, QUEBEC
H. W. PETRIE, LIMITED
TORONTO, ONTARIO

For Export and Import—

Iron — Steel — Metals

Machinery, Raw Products and Manufactured Goods

A. G. KIDSTON & CO.

with offices in

LONDON GLASGOW MONTREAL NEW YORK
AUSTRALIA NEW ZEALAND SOUTH AFRICA

and connections all over the civilized world, have exceptional advantages for the marketing of Canadian and other products. Enquiries invited and promptly handled.

Manager for Canada and U.S.A.:
C. E. GAUSDEN, 17 ST. JOHN STREET, MONTREAL

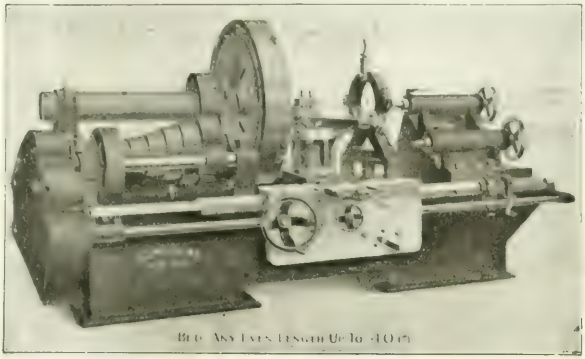
Cables: "KIDCO," Montreal

IMMEDIATE SHIPMENT

30-ft. BED
McCabe 2-in-1 Lathe

26 and 48-INCH SWING
TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-spindle Lathe—26 48-in. Swing.

48-in Swing. Triple Geared ratio 72 to 1.

26-in. Swing. Back-geared.

Turns between centers—24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

Prominent shipbuilders are using McCabe Lathes on long beds.

Thousands in operation all over the world.

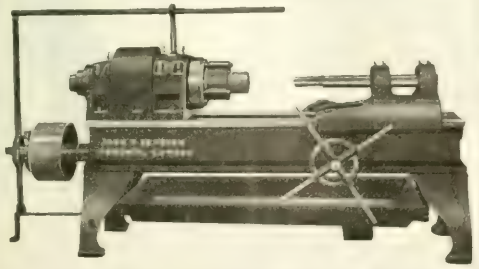
Hepburn---
the Lathe that stands the test

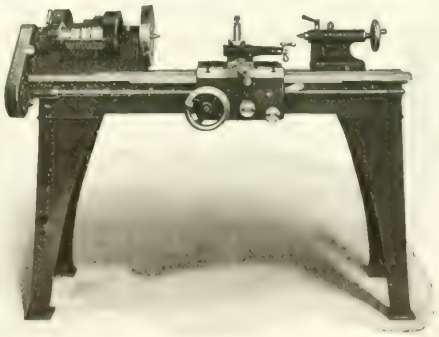
Shell work thoroughly tests the ability of a lathe. The **Hepburn Lathe** is making a wonderful record in the munitions plants of Canada in boring up to 6" shells. It has shown superior speed and superior quality of work and keeps right at it day in and day out. We also rebuild lathes embodying in them all latest improvements.

The Hepburn is the lathe for you.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street Toronto, Ontario





LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.

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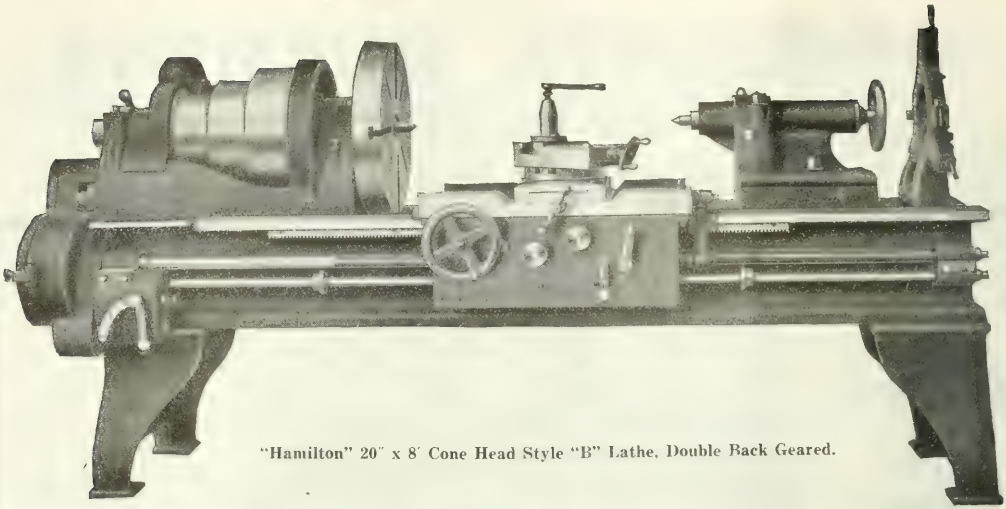


"Hamilton" 20" x 8' Cone Head Style "B" Lathe, Double Back Geared.

HAMILTON LATHES

MERIT

Year after year "HAMILTON" tools have been building their reputation—it has long since been established. To-day it is maintained just as it was built—through merit alone.

Hamilton Machine & Tool Co. mechanics have combined their skill in the construction of this Lathe, and in it have achieved a distinct triumph. Turns out work with unrivalled rapidity and it turns it out to finish style—work that you may well be proud of.

It is a most modern lathe, substantially constructed—built to meet the conditions of to-day for speed and reliability.

You make no mistake when you buy a Hamilton Lathe.

It will Produce.

HMTCo

For 25 Years Makers of fine Machine Tools

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

H. W. PETRIE, Limited - Toronto, Ontario

THE BANFIELD PLUG MILLER

Patented in Canada and United States

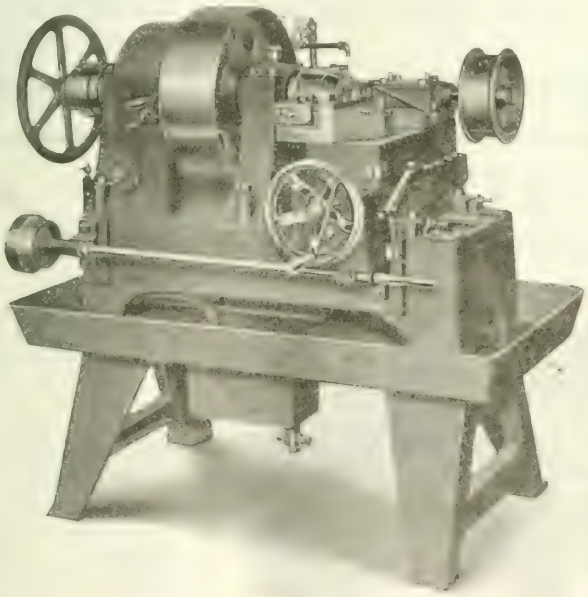
THE COMPLETE PLUG FINISHED IN SIX MINUTES BY UNSKILLED LABOR

A machine especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired and milling the thread—*all in one chucking.*

One man can operate two machines, considerably reducing your cost per plug.

The Banfield Plug Miller is equipped with quick draw in collet.

Drive pulley 18" x 6" with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio with jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds), having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built; simple and economical to operate.



For Turning and Milling the Thread on Gas Check Plugs for 6-inch High Explosive Shells

Weight 1800 lbs.

For 18-pdr., 4.5 and 60-pdr. High Explosive Shells. Can furnish machines of same type, weighing 1250 lbs. Particulars on request. These machines are tooled up for finishing plain machined or bevel plugs if desired.

BASE PLUGS

Machined to Government Specification

Have in stock for immediate shipment machined base plugs for 4.5" 60-pdr., and 6" High Explosive Shells, either threaded or beveled.

Machine work subject to acceptance of Government inspector at your plant.

Capacity 4,000 *per day.* Write for prices.

EDWIN J. BANFIELD

STAIR BUILDING - - TORONTO, ONT.

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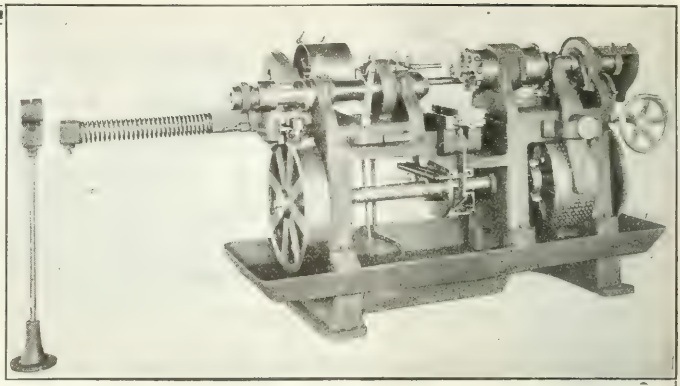
The Chicago Automatic Screw Machine



TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.

The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

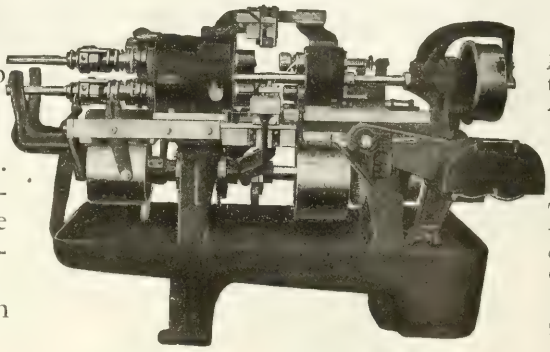
NEW YORK CITY, U. S. A.

European Representatives:
John Macnab, Hyde, England

ACME AUTOMATIC

Multiple Spindle Screw Machine

Chuck capacities up to 3¾" diameter.
Four bars of stock.
Eight tool positions.
All operations performed in the time of the longest single operation.
Acme catalog on request.



No extra operations on the average job due to *Acme features* of

Cross drilling
Side Milling and
Special Shaving Tools.

The "Acme Way" makes the production of duplicate parts (up to 3¾" diameter) rapid, accurate and economical.

Submit your samples or blue prints for quotations.

THE NATIONAL ACME COMPANY

NEW ENGLAND PLANT
WINDSOR, VERMONT

CLEVELAND, OHIO.

CANADIAN SCREW PLANT
MONTREAL, P.Q.

Branch Offices
NEW YORK, BOSTON, CHICAGO, DETROIT, ATLANTA, SAN FRANCISCO
WAREHOUSES—NEW YORK, CHICAGO FOREIGN REPRESENTATIVES

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Oil Fed R & S Tappers *FOR* Great Speed

You will see the difference the first day used.

Top speed all the time—no tap broken.

Output increased—and improved.

R. & S. Tappers—from 3-16" to 5"—are built to cut the cost of tapping by doing tapping work much faster and always accurately.

We'd like to tell you about our Bench, Vertical and horizontal types.

Write.

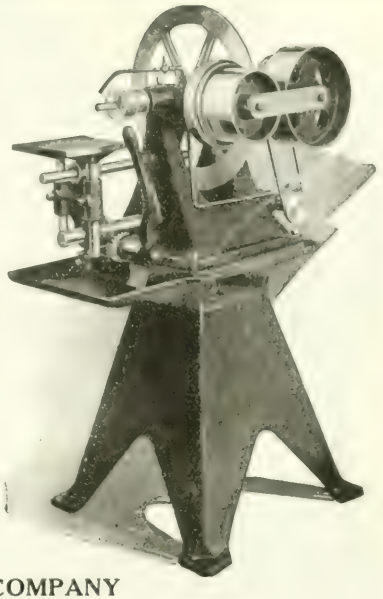


Illustration shows R. & S. 2" Oil Feed Tapper. The continuous Oil Feed adds years to the life of this machine.

RICKERT - SHAFER COMPANY
ERIE, PA., U. S. A.
This is Our Address—How Can We Serve You?

3

WE MAKE THREE (3) ASSERTIONS:

We are making the best lathe built
and we ask you to examine every point of a CISCO in this comparison.

CISCO lathes are most powerful
and we want any manufacturer to show a lathe that will pull more.

No lathes built have more simplified accuracy
and, while we know lots of lathes are accurate, look at the mechanism; see the intricate means of obtaining feeds and speeds. Then look at a CISCO.

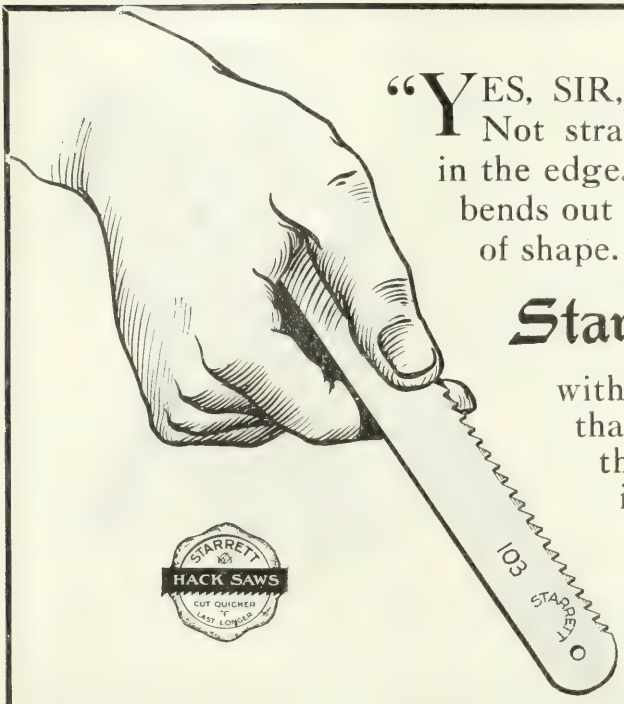
Now if you doubt these points, BUY and TRY

We stand back of every lathe, of every part of every lathe

And we say to you A CISCO IS THE LATHE FOR YOU

SOLD ALL OVER CANADA BY
The
A. R. Williams Machinery Co., Ltd.

MADE IN CINCINNATI, U.S.A., BY
The Cincinnati Iron & Steel Company
14-in., 16-in., 18-in., 24-in. Lathes



"YES, SIR, that's a real hack saw. Not strapping, with notches cut in the edge. Not inferior steel that bends out of shape and stays out of shape. That's a

Starrett Hack-Saw

with snap and whip to it that means business from the time it gets its teeth in the metal until the cut is finished.

"Just a hack saw, you say. But this common name won't do for a tungsten steel blade like this. Why, every tooth in it is milled and set just as if this hack saw were to establish the Starrett reputation.

"And it fits its job, too. Maybe you don't think that's important, but try it yourself.

"You don't call in a grocer when you have a toothache. But there are some mechanics who try that stunt with hack saws—put a brittle, coarse-toothed blade on a piece of tubing and then wonder why it strips. Or use a fine-toothed saw on brass rod and wonder why the teeth clog and the blade snaps.

"You can't treat hack saws mean any more than you can people; and that's another reason why I like Starrett Hack Saws. You don't need to go wrong. The L. S. Starrett Company have got good saws and they know how to pick the one that does the work best. Guess that's why they say that Starrett Hack Saws **cut faster and last longer.** I know they do."

Send for catalog No. 213.

The L. S. Starrett Co.

The World's Greatest Toolmakers

ATHOL, MASS.

NEW YORK LONDON CHICAGO

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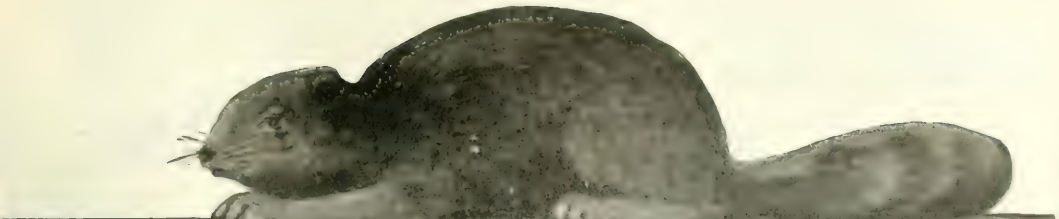

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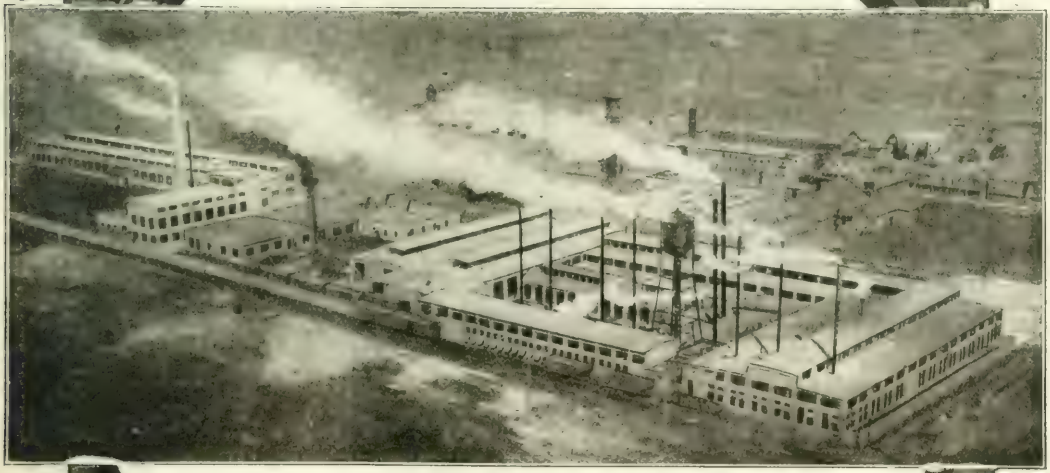

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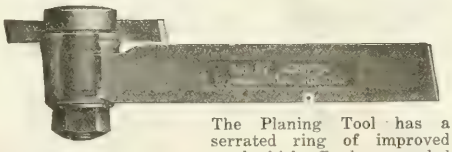

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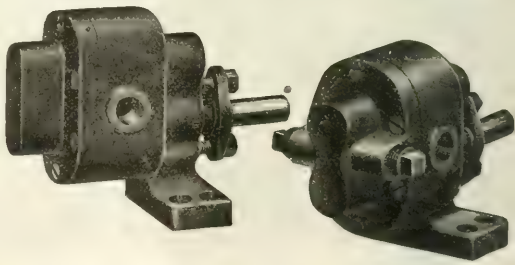

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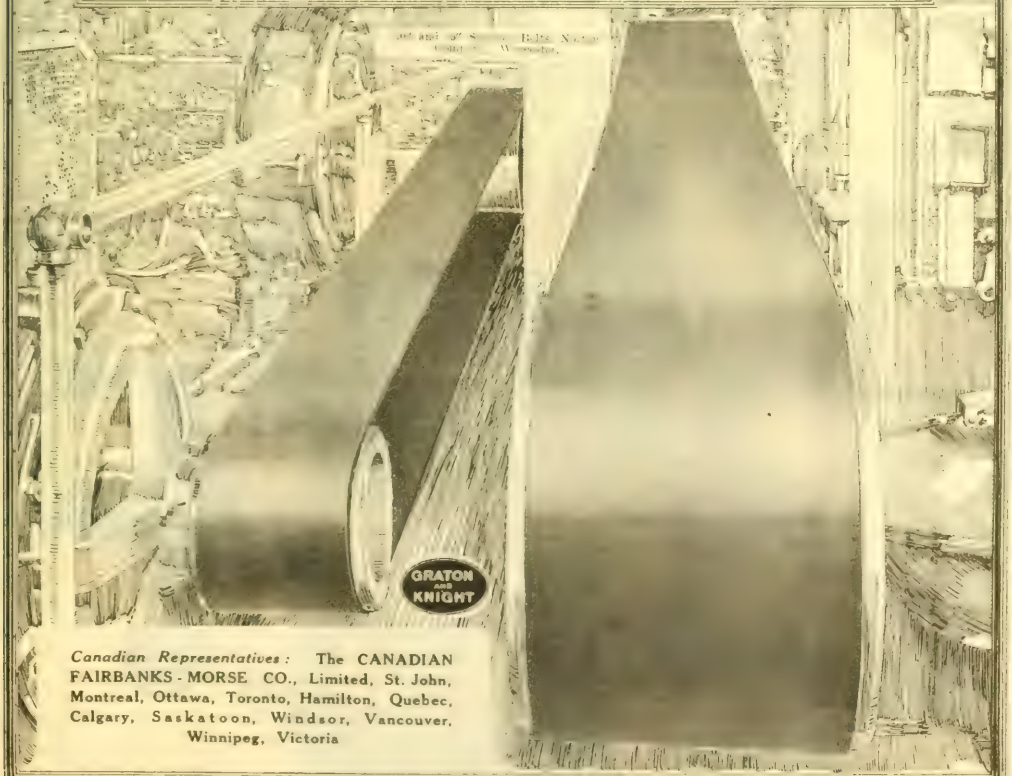

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If you are not acquainted with the Gardner line of Single or Double Spindle Grinders, consider it a pleasure for us to supply you with all the information you desire. Our line is most comprehensive. We maintain a Service Department solely to give valuable service to the trade. Write us. We could help one another.

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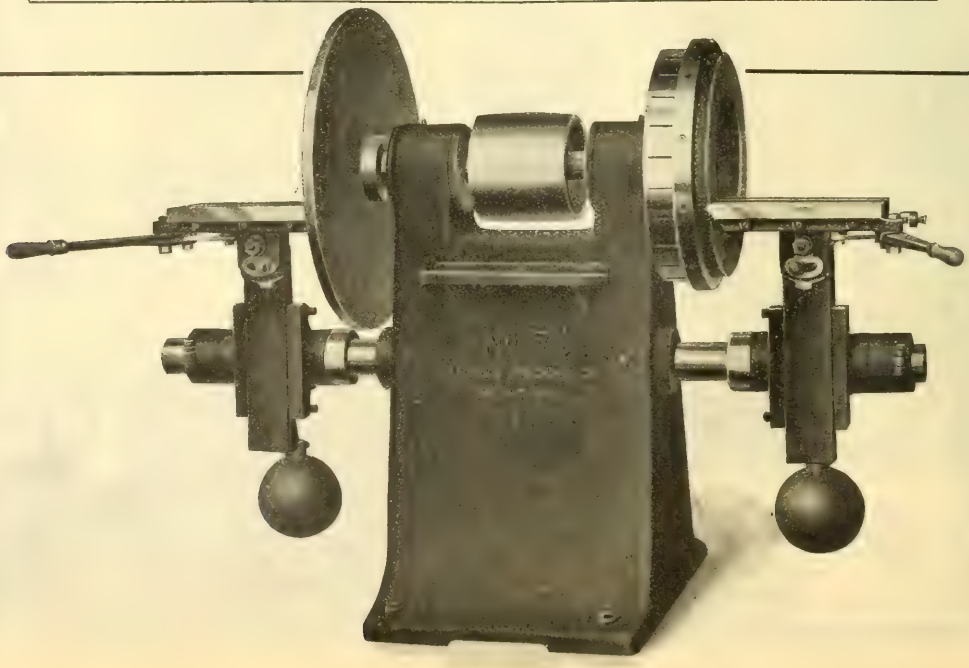

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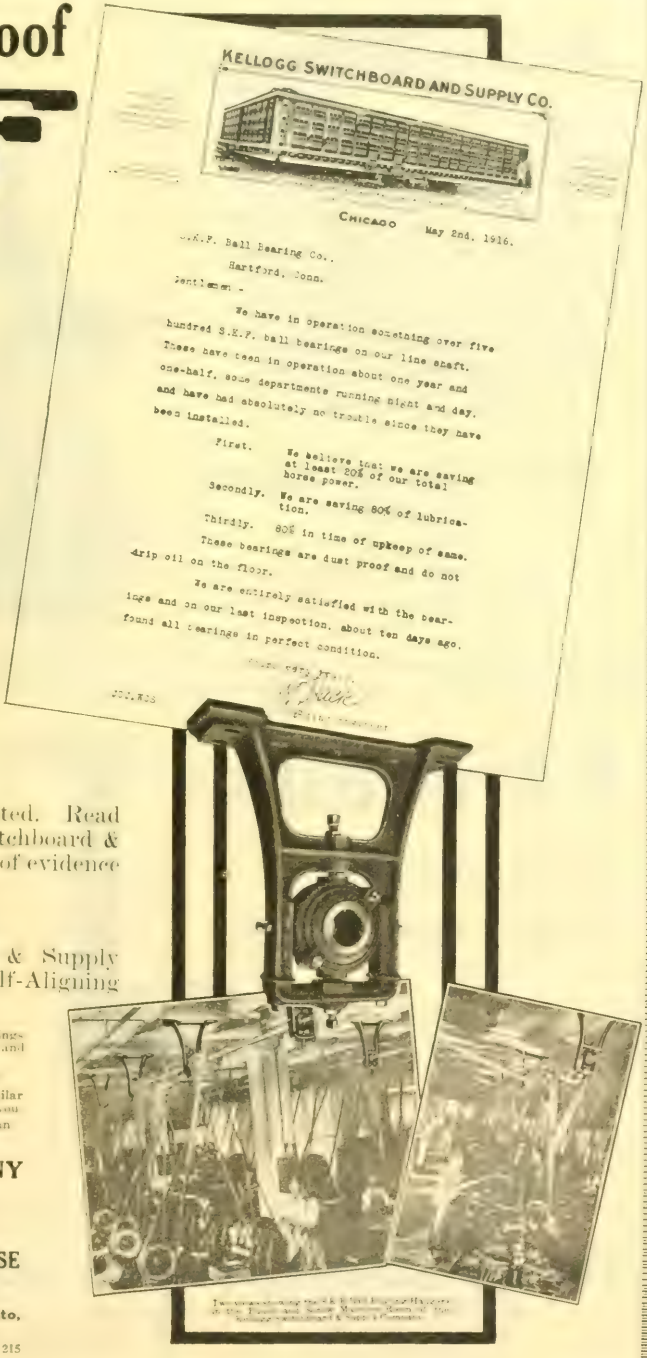
Nothing is as convincing as actual evidence. We might tell you that S K F Ball Bearing Hangers save power. But you want the testimony of the man who is using these hangers. He has nothing to sell you. When the Kellogg Switchboard & Supply Company equipped their plant with S K F Self-Aligning Ball Bearing Hangers, they believed that they would save power, money, lubrication attention and trouble. They believed that S K F were the best means of reducing friction. They were not disappointed. Read the letter from the Kellogg Switchboard & Supply Company. It is the kind of evidence that counts.


KELLOGG SWITCHBOARD AND SUPPLY CO.
CHICAGO May 2nd. 1916.
S.K.F. Ball Bearing Co.,
Hartford, Conn.
Gentlemen -
We have in operation something over five hundred S.K.F. ball bearings on our line shaft. These have been in operation about one year and one-half, some departments running night and day, and have had absolutely no trouble since they have been installed.
First. We believe that we are saving at least 20% of our total horse power.
Secondly. We are saving 80% of lubrication.
Thirdly. 80% in time of upkeep of same.
These bearings are dust proof and do not drip oil on the floor.
We are entirely satisfied with the bearings and on our last inspection, about ten days ago, found all bearings in perfect condition.

Here is the story:

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The power saving is at least 20% of the total horse power.
Lubrication saving, 80%
Time of upkeep, 80% saving.
No leakage of oil.
No wear in the bearings after 1½ years of day and night service.
Need we say more?
Figure out what similar savings would mean to you
Then write us for our Hanger Catalog, so you can review SKF features at your leisure.

CANADIAN SKF COMPANY
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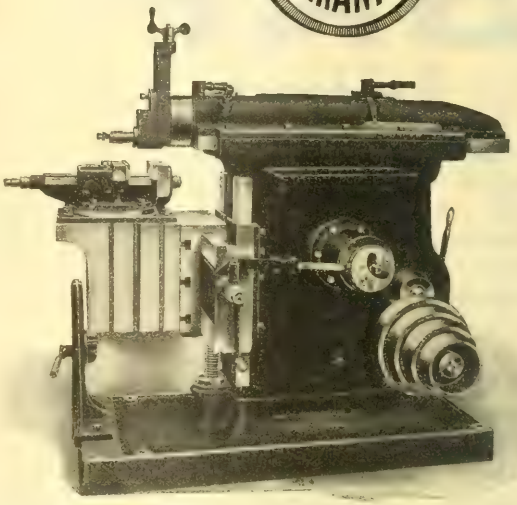

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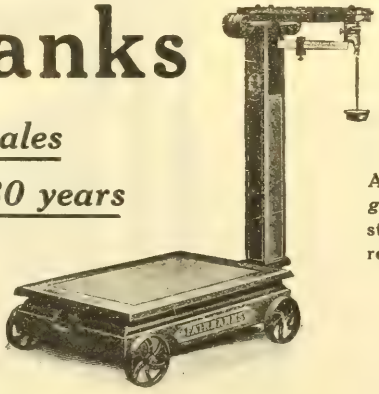

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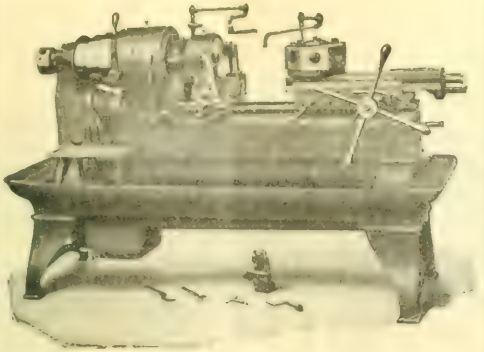

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of the Plain or Wire Feed types

will increase your production. Your turning department will easily keep step with the rest of the shop, for these machines produce interchangeable parts at a rate that maintains a constant high production level.

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These machines are built rugged for long service. They are easy to set up and operate—all control levers are directly before the operator—every movement counts.

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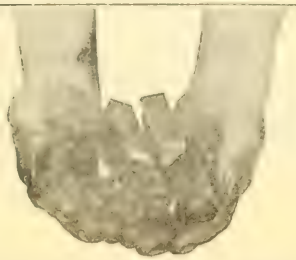

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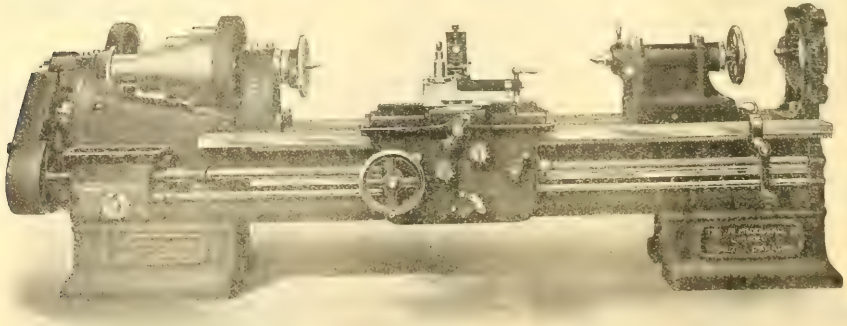


Up-to-Date Patternmaking and Pattern Storage Building

Staff Article

There has recently been completed at the John Bertram & Sons Co. plant, Dundas, Ont., a pattern shop and pattern storage building, which is likely to rank among the best of its kind in the Dominion. The structure is indicative of the progressive spirit dominating the administration of this old-established concern's enterprise, as it does among other things, that valuable patterns should be stored in nothing short of a fireproof structure.

OWING to the variety of types and large size of many of the machine tools which are built at the Bertram plant, Dundas, Ont., the patterns form an important feature in the company's plant. They would be in many cases costly to replace, and suitable storage, is therefore, all the more necessary. The pattern shop and storage are part of a scheme of expansion which is now under way at John Bertram & Sons' plant, and includes a general store and machine shop projected and a handsome office building nearly completed. It should be here stated that the old pattern shop and storage was pulled down in order to make way for an overhead travelling yard crane, which operated between the foundry and the new storage building, thus facilitating the handling of large patterns, etc.

INTERIOR VIEW OF PATTERN SHOP SHOWING LOCATION OF MACHINERY LAYOUT FLOOR IN BACKGROUND.

Constructional Features

The general character of the building will be noted from the accompanying illustrations. It is of flat slab reinforced concrete construction with brick curtain walls, and steel sash with factory wired glass. It is of modern construction in every respect and is absolutely fireproof, even to the extent of providing a sprinkler system and fire doors, which close automatically in case of fire.

The building is 100 feet square and approximately 45 feet high, with a concrete roof, and is constructed so that another storey can be added when required. There are four storeys, including the ground floor and a basement. The building has approximately 45,000 square feet of storage, excluding the spaces occupied by the elevator shaft, stairway and pattern shop. The stairway is built inside the building, and is isolated from the storage rooms, access being obtained by fire doors on each landing. The stairs are of concrete, with chequered steel plate treads and iron pipe handrails. The elevator, which is 12 feet square, runs from the basement to the top floor, the motor and operating mechanism being located in the basement. The elevator was supplied by the Otis Fensom Elevator Co. Each floor has a sprinkler system connected to a standpipe running the full height of the building and served from an existing water tank on the premises. The pressure regulating apparatus is located in the basement. The basement and second floors are used for storing large patterns, and for this reason have plenty of head room, being about 12 feet high. The ground floor, which is also lofty, is partitioned off to form a pattern shop and a pattern storage. The pattern shop takes up rather more than half the floor area, and is separated from the storage by hollow-tile walls, which can be removed in the event of the entire space being required for a pattern shop.

EXTERIOR VIEW OF PATTERN SHOP AND PATTERN STORAGE BUILDING. OVERHEAD TRAVELLER NOW RUNS ALONGSIDE IN FRONT OF MAIN ENTRANCE.

Pattern Shop Feature

The pattern shop is exceptionally bright and roomy, and has a hardwood floor. A work bench, equipped with Emmert's universal pattern vises, extends the full length of the south side of the shop. The machinery is grouped about the centre of the shop, leaving ample space for the lay-out floor, where the

larger patterns are assembled. The shop also contains a lavatory and foreman's office.

The machinery at present installed comprises the following units, but other equipment will be installed in the near future. The machinery driven from the line shaft includes a Downer grinder, a small wood-turning lathe, a tool grinder, and a C.M.C. 30 in. by 40 feet wood-turning lathe. The transmission equipment, including wooden pulleys, was supplied by the Dodge Mfg. Co. The line shaft is driven by a 5 h.p. Can. Westinghouse motor, controlled by a starter, supplied by the Condit Electrical Co., Boston, Mass. All the other machines are driven by individual motors, using Hydro-Electric current 3-phase, 25-cycle. These machines include the following:—A 24-inch planer supplied by P. B. Yates Machinery Co., Hamilton, Ont., and driven by a 10 h.p. Can. Westinghouse motor; one C.M.C. rip saw, driven by a 5 h.p. Can. Westinghouse motor; one 16-in., a C.M.C. jointer, driven by a Can. Westinghouse 5 h.p. motor; an 18-inch cut-off saw, by P. B. Yates Machine Co., driven by a 3 h.p. Crocker Wheeler motor; and two 36-in. C.M.C. band saws, driven by 3 h.p. Crocker Wheeler motors. Ample provision for artificial lighting has been made, the main switches for both the pattern shop and entire building being located in the pattern shop. The section of the ground floor not occupied by the pattern shop is used for storing large patterns.

Small Pattern Storage

The third and top floors are used for storing smaller patterns. An interesting feature on the third floor is a system of steel racks for storing the smallest patterns. There are six rows of racks, each being approximately 80 feet long. The top racks are barely six feet from the floor, so are easy of access. The accompanying illustration shows, in a general way, the arrangement and style of these racks. The racks are all numbered and a record of the patterns is kept by means of a card index. The larger patterns on the other floors are arranged in numbered sections and a record is kept in the same way. The patterns themselves are also numbered. By means of the above system it is easy to keep track of each and every pattern in the building, and no time is lost when any particular pattern is wanted.

SHOWING STEEL STORAGE RACKS FOR SMALL PATTERNS ON THIRD FLOOR OF PATTERN STORAGE BUILDING. NOTE SPRINKLER SYSTEM.

Overhead Runway System

A system of overhead runways is installed to facilitate the handling of heavy or bulky patterns. The system, which was supplied and installed by the Herbert Morris Crane & Hoist Co., of Niagara Falls, Ont., is used in all parts of the building except on the third and fourth floors, where the lighter patterns are kept. On the second floor the runway serves two sides and one end of the store room for carrying patterns to the elevator. There is a switch in the system where the two lines connect up near the elevator. The layout in the basement is essentially the same as on the second floor. On the ground floor the system is arranged to serve the storage section and also the lay-out floor in the pattern shop. The branches of the system converge at the elevator, the tracks and switches being arranged to give the most efficient service. The pulley blocks have a capacity of one ton, and the trolleys are equipped with a buffer device.

The general contractors for the building were the E. G. M. Cape Co. of Montreal, who sub-let the various smaller contracts. It may be of interest to note that some of the concrete work was done in almost zero weather, which apparently had no ill-effect. The construction of the building was completed in May and machinery in the pattern shop installed during the month of July. All the contracts have been successfully carried out, and the building is a valuable addition to the company's plant.

PART OF LAYOUT FLOOR IN PATTERN SHOP SHOWING SYSTEM OF OVERHEAD RUNWAYS WITH ELEVATOR IN BACKGROUND.

FUEL REGULATIONS ISSUED

AN Order-in-Council has been passed by the Dominion Government authorizing regulations issued by the Fuel Controller for Canada, respecting the importation and sale of coal, which go into effect in November.

Provision is made for the licensing of all importers and dealers in coal now doing business in Canada and that may, hereafter, desire to do so. Application must be made to the Fuel Controller be-

fore November 21, by registered letter, for a dealer's or importer's permit. Heavy penalties are provided for doing business without permit. Provision is also made for the cancellation of permits in cases where any dealer has been found guilty of giving short weighs or where any other sufficient cause exists.

Under the regulations every mine operator in Canada must forthwith enter into an agreement with the Fuel Controller fixing the maximum prices per ton he may charge for the output of his mine.

The most far-reaching provision of the new regulations are those dealing with dealers' commissions and profits. Brokers are allowed a maximum of 30 cents per ton for their services, wholesalers a maximum of 35 cents per ton, and retail dealers a sum not exceeding 50 cents per ton. These maximum profits are allowed over and above reasonable overhead and handling charges, and will effectually do away with profiteering in coal.

FOREIGN CAPITAL IN BRITAIN

THE future attitude of British business houses toward firms controlled from foreign sources, and operating in such a manner as to appear essentially British in character, is indicated by the fact that the Enemy Influence Sub-committee of the Unionist War Committee have been considering what steps should be taken to prevent foreign-controlled companies or corporations from passing themselves off in the future as British concerns, without discouraging the investment of foreign capital in British business. The "British Trade Review" states that after giving full consideration to the various aspects of the matter, the committee are of the opinion that it would be reasonable to require that where a company or corporation carrying on business in the United Kingdom is actually under foreign control, unless the existing title of the company clearly and correctly designates its foreign nature, the fact should be disclosed in its title by adding the words "foreign controlled," so that every one having dealings with it may be aware of such foreign control. For the purpose of legislation it is suggested that the expression "foreign-controlled company" shall mean any company or corporation: (1) Where the majority of the directors are not British subjects of British parentage; (2) where control has in fact been exercised by reason of shares of the company having been held by persons who are not British subjects; (3) where the executive is a foreign-controlled company, or where the majority of the executive are appointed by a foreign-controlled company. Legislation on these lines is very desirable.

THE NAUTICAL MILE

By R. Hamilton.

HOW often do we hear the expression "knots per hour" when reference is made to the speed of a vessel? This phrase while not entirely erroneous is nevertheless misleading, as the uninitiated are inclined to infer that a corresponding speed on land would be expressed as miles per hour. In reality, the values of the land and the sea mile are widely different, that of the latter being approximately 1/6 greater than the former; the relative distances being 5280 feet and 6080 feet. The speed of a vessel is indicated in nautical miles per hour, or simply so many knots. To make this meaning more clear it might be well to briefly define the origin of the term. During the primitive days of navigation it is doubtful if much consideration was given to the speeds of such vessels as then existed, but before the adoption of the "continuous log"—the recognized instrument for calculating ship speeds of the present day—it was customary for sailors to ascertain the vessel's velocity by means of the "common log." Its employment depends on the fact that a piece of wood attached to a line is thrown overboard (casting the log), to lie like a log in a fixed position, motionless, the ship's speed being calculated by observing what length of line ran out in a given time.

Ship's Speed by Common Log

To ascertain the ship's speed by the common log, four articles are necessary —a log-ship or log-chip, log-reel, log-line, and log-glass. The log-ship is a wooden quadrant ½ inch thick, with a radius of 5 or 6 inches, the arc of which is weighted with lead to keep it in a vertical position, and thus retard its passage through the water. Two holes are made near its lower angles. One end of a short piece of thin line is passed through one of these holes, and knotted, while the other end has spliced to it a hard bone peg, which is inserted in the other hole. The holes are so placed that the log-ship will hang square from the span thus formed. The log-line is secured to this span and consists of two parts. The portion nearest the log-ship is known as the "stray line"; its length varies from 10 to 20 fathoms, but should be sufficient to insure that the log-ship shall be outside the disturbing element of the ship's wake. The point where it joins the other part is marked by a piece of bunting, and the line from this juncture towards its other end is marked at known intervals with "knots," which consist of pieces of cord worked in between its strands.

A mean degree of the meridian being assumed to be 69.09 statute miles of 5280 feet, the nautical mile (1/60 degree) is taken as 6080 feet, which is a sufficient close approximation for all practical purposes, and the distances between the knots on the line are made to bear the same relation to 6080 feet as 28 seconds to an hour (3600 seconds): that is, they are placed at intervals of 47 feet 3 inches. The end of the first interval of this length—counting from the piece of bunting—is marked by a bit of leather, the second by a cord with two knots, the third with three knots, and so on; the middle of each section (half knots) being marked with a cord with one knot. Suppose eight knots of the line runs out in 28 seconds, the vessel has gone 5 x 47¼ feet in that time, or is travelling at the rate of 5 x 6080 feet (five nautical miles) an hour; hence the common use of the term "knots," as equivalent to nautical miles per hour. In the log-glass the time is measured by runing sand, which however, is apt to be affected by the humidity of the atmosphere. Some practice is made of the 30-second glass, in which case the intervals between the knots on the log-line are made 50 feet 7 inches instead of 47 feet 3 inches. For speeds over six knots, a 14-second glass is employed, and the speed indicated by the log-line is doubled. In preparing a new log-line it is first well soaked, stretched and marked with knots, and wound uniformly on the log-reel, to which the inner end of the line is securely fastened.

"Heaving the Log"

To "heave the log," a man holds the log-reel over his head (at high speeds the man and portable reel are superseded by a fixed reel and a winch fitted with a brake), and the officer places the peg in the log-ship, which he then throws clear and to windward of the ship, allowing the line to run out freely. When the bunting at the end of the stray line passes his hand the officer calls to his assistant to turn the glass and permit the line to pay out freely. When all the sand has run through, the assistant calls "stop" when the log-line is quickly nipped, the knots counted and the intermediate portion estimated. The strain on the log-ship, when the line is nipped, causes the peg to be withdrawn from it, and the log-ship is readily hauled in. In a steam vessel running at high speed on an ocean route, with engines working smoothly and uniformly, a careful officer with correct line and glass, can obtain very accurate results with the common log.

RAILWAY ASSOCIATION FOR NATIONAL DEFENCE

AS a result of suggestions made by the Government that during the period of the war there should be closer co-operation between the railways of Canada, an association has been formed by lines corresponding to the railways war board of the United States with the object of securing greater co-operation not only between the railroads themselves, but also between the railways and the public.

The new board will be known as the Canadian Railway Association for National Defence and will have general authority to formulate in detail a policy of operation for all or any of the railways for the co-ordinating of industrial activities toward the prosecution of the war and for rendering the most efficient possible service to the national cause. It is expected that through heavier loading of cars, elimination of unnecessary train service, the co-operative use of all facilities, etc., to the best advantage the country's needs may best be served.

The Education and Training of Foundrymen by Mail

By C.T.R.

It should be the ambition of every man, who has a trade, to become a high grade exponent of same, and while common school, high school and university education as preliminaries may and do contribute a whole lot to that end as auxiliaries to natural deftness and keenness of perception, research, discovery and development, which are increasingly active, make it encumbent that the further education of oneself suffer neither restriction nor let-up in its quest and appropriation. Opportunities to this end are many and varied.

At the recent Exhibition of foundry equipment and supplies held in the Mechanics' Building, Boston, Mass., under the joint auspices of the American Foundrymen's Association and the American Institute of Metals, not the least interesting among the many excellent booth displays, because of its wartime appropriateness and actual practical demonstration of progressive foundry effort, was that staged by "McLain's System," of Milwaukee, Wis.—to wit, the tangible and visible results of instruction in foundry practice by mail. For obvious reasons, we refrain from making observations or from giving even a brief description of the varied type and size shell shown in the accompanying illustration; the fact that they are in no sense experimental projectiles, but real war-time utilities, and the further fact that their metallic constituent and method of production are creations of a system of instruction for foundrymen by mail—otherwise correspondence—make elaboration or intricate detail superfluous and unnecessary under the circumstances.

Foundrymen beyond the confines of the United States are not as familiar as they might be with the history and development of McLain's System, which is practically the life story and foundry experience of one man—David McLain—crystallized, and made to shoot its beams of light into the darkness, figuratively speaking, so long surrounding foundry practice and militating against progressive effort, not to mention achievement. It is not, of course, to be understood that David McLain was the lone star in the foundry firmament, but he certainly can lay claim to be one of less than a score of American foundrymen who have been responsible for the craft uplift of the present century, and to whom the greatest credit is due for the high standing the industry to-day enjoys, not only in the United States, but also in Canada and Great Britain.

It should be an inspiration to budding and prospective foundrymen to know that David McLain rose from the ranks. Somehow our hearts go out to such a one, no matter what his particular vocation. Great Britain's present chief of staff for the conduct of her gigantic military operations—Sir William Robertson—rose from the ranks. Men are rising to prominence—in some cases to mere publicity—every day; the records are, however, not always such as to inspire. McLain's history of himself, starting with his birth in Belfast, Ireland, and his quitting the "Old Sod," when five years of age, with his parents, to journey to Pittsburgh, Pennsylvania, is brimful of human interest, and has a tendency to make one feel like getting to know the man a little better and compare notes and personalities with a view to finding out just where his strength lies comparatively.

Times were hard in Pittsburgh; therefore, during the panic of 1873 little Dave McLain set out to help support the family of which he was a member. He seems to have been destined for the foundry from his early boyhood, for at ten years of age we find him twisting hay ropes for core barrels in Smith's pipe foundry, Pittsburgh, at $2.25 per week. An explosion in a pipe pit, which killed twenty men, unnerved him somewhat, so

"McLAIN'S SYSTEM" BOOTH AT THE EXHIBITION OF FOUNDRY EQUIPMENT AND SUPPLIES, HELD IN BOSTON, MASS., DURING WEEK OF SEPTEMBER 24, 1917.

he quit foundry work, but not for long; to use his own words, "I naturally drifted back to the foundry, working both in iron and steel." The latter circumstance seems to have been a very great convenience, as well as profitable, for, quoting him again, "when I could not get a job in one I would work in the other." The human interest reference above to Dave

DAVID McLAIN IN A TYPICAL DEMONSTRATION POSE.

McLain's business career may at this point be judged as to merit by the following paragraph:

"At the age of eighteen," he says, "I was married and earning moulder's wages. All I could see ahead of me was the sand heap—'typical of the times.' I had no education to speak of, neither had I influential friends; yet I felt I must get away from it. On the floor to my right was John Williams, 65 years of age; on my left was Frank Jones, some 52 to 55 years of age. I would stop work at odd times, lean on my rammer, look first at John and then at Frank, and wonder if I was going to end the same way."

Books on foundry practice were not available in those days, and trade papers were more or less in their infancy, in both of which respects the rising generation have much to be thankful for, and perhaps more so as regards iron and steel founding. Later from the brain of an ambitious moulder was evolved and established, that world-known publication, "The Foundry," of Cleveland, Ohio. Evening class tuition in the arts and crafts, technical and correspondence school instruction were, if existent, but as the shadow to the substance of our day.

Dave McLain was dour enough to have been born in the "Land of the Heather," judging by the way he persisted in educating himself, notwithstanding many apparently insuperable difficulties. As a result we find him in charge of a grey iron and steel shop at the age of 23, from which circumstance he lays claim to being the oldest steel foundryman, in point of experience, in the United States or Canada.

Mixing irons by analysis, not by guesswork, tradition, or some rule-of-thumb method, equally unsatisfactory, had burned itself into the heart and head of young McLain; little wonder, then, is it that the melter, so long regarded as a sort of craft deity, but who in reality knew nothing of the constituent of his cupola mixtures, got out of harmony with his surroundings. "All irons are good irons when you know how to use them," is an axiom of McLain's System, and few will be disposed to challenge the assertion.

At 35 years of age David McLain was drawing $3,000 per year as foundry superintendent. He was still drawing heavily—and is yet, on the research of himself and others in the matter of a larger and wider development of foundry enterprise, and it was when, with 35 years' practical experience behind him, he made his decision and established his system of scientific mixing and melting and the manufacture of the much discussed material entitled semi-steel. As regards nomenclature, much difference of opinion exists as to the product being so described. For the purpose of this article, nomenclature is largely, if not wholly, immaterial.

McLain's research and experiment in the direction of charging certain percentages of steel into the iron foundry cupola, to attain a product of some definite strength, homogeneity, and readily machined, did not at first appeal to those more directly concerned, or whose best interests were most directly at stake. Steel had been added to iron in the ladle for 50 years or more preceding the McLain discovery, and even slight amounts were on record as having been charged to the cupola. So far as large percentages of steel being employed in light castings are concerned, no records were, however, available.

With confidence begotten of knowledge, therefore, and being a "child of the foundry," so to speak, and with the best interests of his craft as strongly embedded in his bosom as those of his own personal interest, in January, 1908, David McLain quit a high-salaried position to establish what is getting to be quite universally known as McLain's System of Instruction for Foundrymen by Mail. In the decade now almost past since embarking on this new and untried enterprise, vicissitudes have not been lacking, opposition being on many occasions powerful, menacing, and jeeringly disposed. Here and there good sports among foundrymen came out into the open. They recognized a ring of sincerity about Mac that was worth taking a chance on, and to their surprise they won out on the venture.

Good news travels quickly; in any case, there are men in all ranks and trades and crafts who are on the lookout for bigger and better things, and such never fail to be in the right place at the right time. Is it any wonder, then, that there is today no representative of the foundry craft more highly respected and appreciated—iron or steel—by his confreres and contemporaries, in the United States, than David McLain, and no more popular enterprise than McLain's System of Foundry Instruction by Mail.

The open-hearth furnace for steel melting, as well as the cupola for grey iron or semi-steel, is included in the scope of the work undertaken by McLain's System, Goldsmith Building, Milwaukee, Wisconsin, and, judging by the clientele—plant administrative, foundry superintendents, foundry foremen, and men on the floor, whose ambitions are to get on top of the sand heap, who have passed through and are still on the books of the "System," it is not assuming too much when we make prediction that the coming handful of years will show even greater development than any like period preceding, much as that most immediate has unfolded.

Unique in many respects as is this McLain's System from trade uplift and efficiency of production points of view, that of its business management and administration is easily no less so. Known to hundreds of foundrymen all over the United States, Canada, and Europe is the signature of "I. V. Scanlan," attached to letters of technical and practical import issued from McLain's System headquarters. Foundrymen attending the annual exhibition of equipment and supplies for the first time receive the sur-

I. V. SCANLAN,
Sees Areas and Chief Assistant, McLain System, Incorporated.

prise of their lives in meeting I. V. Scanlan, for I. V. is not a man at all, but a keen-eyed, alert, slenderly-built young woman.

Miss Scanlan has the distinction of being the only woman in the world who teaches the foundry business to foundrymen. The technique of the subject, the diagnosis of complicated metals and mix-

tures hold no terrors for her; as a matter of fact, she simply revels in the work, bringing to the many problems involved a brain that many of us are disposed to envy, and a precision of expression readily appreciated by those interested in the various solutions. As first assistant to Mr McLain, she has assumed almost entire charge of the business, and that she is partner in same as well is due to Mac's business acumen, for he discovered quite early in his correspondence school enterprise that she was too valuable an asset to risk losing by any chance.

Needless to say, hard work and hard study are the secret of Miss Scanlan's success, and aside from the personal instruction of her chief, nothing has contributed more to acquirement of the craft knowledge she now possesses than the intimacy with progress and development in foundry practice recorded in the columns of trade and technical journals.

WOOD SHIPBUILDING AT MONTREAL

AMONG recently established wood shipbuilding plants, attention may be directed to that of Fraser, Brace & Co., of Montreal. Although a new departure for this firm, they go into it with a wide expert knowledge of large construction work and engineering undertakings generally. They have acquired a very desirable location for the plant site, which consists of approximately eight acres adjoining the Lachine Canal, on the south side of the latter and in the district known as Cote St. Paul. The shipyard offers ideal conditions for its specific purpose, forming an old basin that is readily and rapidly being transformed into an excellent slip or dry dock. When this basin was formerly used, the entrance was spanned by the bascule bridge on the C.P.R. which runs parallel to the canal; the abutments for the bridge being of concrete. The dam that at present prevents the water of the canal from entering the basin will eventually be replaced with a lock gate, so that the basin will form a dry dock 600 feet long and 150 feet wide; sufficiently large to provide erection and working space for four wood ships, each of which will be 250 feet long and of 42 feet beam.

Excavation is nearing completion, as will be seen from the accompanying photograph which shows the progress made at the middle of the present month. The buildings in the background are being equipped with the most modern machinery, so that with the possible exception of the first two vessels, and probably even for a large portion of these, the timbers used in the ships will be dressed directly from the logs being brought in by rail from the forests of Quebec and adjacent territory. For the present and immediate future, the timbers required will be brought from Oregon and British Columbia. The initial contract secured is for four standard 2,500 ton boats, and the keels for two of these are now being placed on the pile foundations which have been laid on the eastern bank of the slip. The illustration shows one of the main keel timbers being laid in position for the first vessel. The first two will be side-launched when completed. The keels for the other two will be laid in the bed of the slip, and when the boats are finished they will be floated by simply flooding the slip, water being allowed to pass through the canal entrance. This method will eliminate the construction of launching ways and will also facilitate the actual "launching" operation.

A tentative contract has been obtained for other four boats of the same class, and provision is being made to accommodate the entire eight at the one site; four in the slip and the remainder on the upper level. Buildings have been erected for offices, stores, air compressors, transformers, saw mill, also carpenter and machine shops. A mold loft 150 feet by 50 feet has also been provided. The power used throughout will be electric. The property adjoins both the G.T.R. and the C.P.R., admitting of facilities for the handling of materials promptly and direct to the job.

It is anticipated that within a few months Fraser, Brace & Co. will have a force of about 600 men employed as the first four boats are to be delivered by the middle of 1918. Their contract covers the building of the hulls only, the installation of propelling machinery, general equipment and the interior fittings being taken care of by other contractors.

SHIPYARD OF FRASER, BRACE & CO. IN THE MAKING AT MONTR EAL. NOTE THE KEEL TIMBER FOR A WOOD SHIP BEING PLACED IN POSITION.

U. S. LENDS STEAMERS TO ITALY

THE United States Shipping Board has agreed to charter to the Italian Government approximately 25 American commandeered steel ships of an aggregate of 100,000 deadweight tons, to relieve Italy's shortage of shipping for the transport of urgently needed supplies. This action was onnounced on Oct. 26 by Chairman Hurley, of the Board. Great Britain has been supplying France and Italy with shipping to meet their emergency needs, but cannot continue to do so in view of her own increasing shipping requirements.

Italy has strongly represented its great need, and she gets five more ships than were allotted to the French Government earlier in the present month.

Part of the ships chartered will be old and part new, and some may be taken from those on the way from the Great Lakes to the ocean. They will be used between the United States and Italian ports.

Increase in Price of Coal at Mines.—President Wilson last Saturday granted an increase of 45 cents a ton in the price of bituminous coal at virtually all mines in the country, effective at 7 o'clock Monday morning. The new price will absorb wage increases recently agreed upon between operators and miners in the mineral competitive and other fields.

Brass and Other Copper Alloys Used in Marine Engineering*

By T. Milton

In this paper it is intended only to deal with brass and other copper alloys in their different forms as they are used by the marine engineer, and it will be found that even with this restriction the subject covers a great deal of ground. The author is chief engineer surveyor of Lloyd's Register. By virtue of his position he is therefore well qualified by experience to give an expression of opinion warranting close attention of all engaged on marine work.

THE first point to be mentioned is that of nomenclature, and this is found to be a very difficult matter. Marine engineers, as well as many others who use brass, bronze, and various alloys of copper and other metals, have very vague ideas as to names, calling all sorts of metals "brass" which are not true brass, and calling others "bronze" which are more nearly allied to brass than to bronze. In fact, we generally call parts of bearings "brasses" which are made of so-called gun-metal, phosphor bronze, or anything but brass. Even when they are made of cast steel or cast iron and lined with white metal they are often still called "brasses." Some of the white metals are sometimes called "bronzes."

The Terms Brass and Bronze

It has been recommended that the term "brass" should be restricted to alloys of copper and zinc only, but containing more copper than zinc, i.e., containing over 50 per cent. copper. An alloy containing a third metal is to be denoted with the name of the additional element used as a prefix. Thus the alloy containing 1 per cent. of tin, 29 per cent. of zinc, and 70 per cent. of copper used for Admiralty condenser tubes should be called "tin-brass." Similarly, the term "bronze" should be used to denote an alloy containing more than 50 per cent. of copper, the remainder being tin only. If other metals are present, then their names should be used as prefixes, thus the ordinary Admiralty mixture usually called "gun-metal," containing 88 per cent. of copper, 10 per cent. of tin, and 2 per cent. of zinc, should be called "zinc-bronze." It may be stated that these names have not yet come into general use, and both the terms "brass" and "bronze" are being frequently used in most misleading ways.

Even the name gun-metal conveys no precise idea, either of the composition of the metal or of what a gun is made of, as when copper alloys were used for making guns they were generally composed of copper and tin only; that is to say, they were "bronzes," whereas the term "gun-metal" is now more often employed to denote an alloy containing zinc in addition to copper and tin. Moreover, these guns were generally spoken of by the soldiers who used them as "brass" guns.

In this paper the alloys will be spoken of by the names usually employed, although they are admittedly not precise, but it is hoped that no misconception will arise through the use of these common names, as it is intended in all cases to state the main elements of their composition.

Copper-Tin Alloys

Copper-tin alloys were known and used in the remote past, in the so-called "bronze" age before the use of iron. It is stated that a rod of metal found by Dr. Flinders Petrie, at Meydum, was found to contain 89.8 per cent. of copper and 9.1 per cent. of tin. It was estimated to date from 3700 B.C. Objects of bronze were found at Troy, supposed to date from 1200 B.C. The first artificer we read of in the Bible was Tubalcain, who was an instructor of every artificer in brass and iron. In Hiorns' book on alloys there is a question from another work, in which it is stated that the word translated as "brass" in this and in other places in the Bible, probably refers to "bronze," an alloy of copper and tin. From Percy's Metallurgy, however, it is evident that real brass, i.e., an alloy of copper and zinc, was in use in Roman times. He gives the analyses of four ancient coins, all containing not less than 10 per cent. of zinc, of dates about 20 B.C., 60 A.D., 79 A.D., and 120 A.D., and also analyses of other ancient brass coins of somewhat later period; one of these has a composition which would be suitable for making condenser tubes. Percy states that although zinc was used in these ancient alloys, it was not known as a separate metal. He implies that it was not until the 16th century that zinc was so known, and that from the Roman times until then the brass alloy was made by what is known as the "calamine" process, a method which was in use in Great Britain so late as 1859.

Calamine

Calamine is a zinc ore consisting primarily of carbonate of zinc. In making brass 100 lbs. of calcined calamine was mixed with 40 lbs. of ground coal and a little water. This was then mixed with 66 lbs. of bean-shot copper and charged into crucibles which, in groups of nine, were placed in a furnace. The heat applied permitted the coal to combine with the oxygen of the ore. At a temperature somewhat below the melting point of copper the zinc which was reduced was vaporous and combined with the copper which, being in small pieces, presented a large surface to the action of the zinc vapor. The brass produced in this way has about the composition of 2 parts copper to 1 of zinc. "Calamine" brass was for a long time thought to be of superior quality to brass produced by the direct mixture of zinc and copper, which is the method of manufacture now always adopted.

Copper and Zinc Alloys—Brass

Copper and zinc alloy in all proportions, and the alloys throughout their range have been scientifically studied perhaps more than any other series of alloys. Law gives a table of no less than 144 records collated for the Committee on Alloys appointed by the United States Board (reported in 1881). G. Charpy, an eminent French metallurgist, in a volume upon alloys, published by the Societie Nationale d'Encouragement, Paris, has given a very complete account of the microstructure of these alloys. A. H. Hiorns in his book on "Metallic Alloys" gives a table of 54 different alloys mainly of copper zinc, but a few containing small quantities of other metals. He also gives a table of the freezing points of the alloys throughout the range, which table agrees with the curve given in the Fourth Report of the Alloys Research Committee of the Institute of Mechanical Engineers, which report deals with alloys of copper and zinc, and also those of copper and tin.

This report points out that the brass alloys which admit of industrial application are those containing from a minute proportion of zinc to 45 per cent. of that metal. When the proportion of zinc becomes as high as 50 per cent., the alloys become fragile. The report states that it is found that generally the limit of elasticity, the resistance to penetration, and the hardness increase with the proportion of zinc, the tenacity also increases until it attains a maximum at about 45 per cent. of zinc. The extensibility, compressibility, and reduction of sectional area increase with increase of zinc, but attain their maximum at about 30 per cent.

In alloying copper and zinc there is no doubt whatever that true chemical union takes place between the metals, but this can only occur in atomic proportions. The atomic weights of the two metals are nearly equal, being 63.2 for copper, and 65 for zinc. Various experimentees have considered that the compounds $Cu\ Zn$, $Cu\ Zn_2$, $Cu_2\ Zn_3$, $Cu_3\ Zn_5$ all may exist. In the tables of brass alloys quoted both by Hiorns and Law, compositions are given ringing by units right up to $Cu_3\ Zn_2$ and down to $Cu\ Zn_2$. What might fairly be considered is that the alloys containing the least proportion of zinc are composed of a compound of copper and zinc existing as a solid solution in copper, and that those containing more zinc as solid solutions of one zinc copper compound in another compound of different proportion.

Copper Zinc Alloy Structure

When copper zinc alloys are examined microscopically by suitably preparing etched and examined under a micros-

*From paper read before the Institution of Marine Engineers, the author being a vice-president.

and etching sections, it is found that all those containing from about 67 to 100 per cent. of copper have a uniform crystalline structure. Those of less copper content down to about 55 or 50 per cent. have a duplex structure; that is to say, they consist of two constituents, at about 50 per cent. one constituent only is present. The above refers to the metal, both in the annealed and also in the "hard-worked" condition. If, however, the metal is raised to a very high temperature and quenched, the duplex structure is found to have disappeared. Apparently the two constituents mutually dissolve into one another at a high temperature, and are retained as solid solutions by quenching. Slow cooling, however, permits them to again separate, and the slower the cooling the more complete is the separation which takes place. In the alloy named "Muntz metal," containing approximately 60 per cent. copper and 40 per cent. zinc, the separation is well marked.

Improved By Working

All the alloys containing 55 per cent. and above of copper have their useful properties considerably improved by working. Those below, about 66 per cent. of copper may be forged or rolled hot, Muntz metal being easily so worked; above 67 per cent. it is generally considered that the metals can only be worked cold. As the critical proportion, say 66 or 67 per cent., is approached, more care is required in forging hot. Muntz metal and the other low zinc alloys can also be worked cold as well as hot. In all cases of cold working every deformation given to the metal hardens it and renders it less able to withstand further deformation, but this hardness may be removed by annealing.

A remarkable example of how cold work can alter the shape of a mass of metal without producing fracture was given by Sir William Anderson in the discussion on the Fourth Report of the Alloys Research Committee, in an explanation of the manufacture of brass cartridge cases for 6-inch quick-firing guns. These are made from an alloy of 70 per cent. copper and 30 per cent. zinc. This is rolled cold into a plate from which circular discs are cut. The discs are then pressed cold into a cup shape, then annealed and cleaned. The cups are then gradually drawn out into close-ended tubes, thinner and thinner, each draw, except the last one, being followed by annealing and cleaning. In all, there are eight annealings, the whole of the work being done cold.

Marine Engineering Applications

The same alloy, 70 per cent. copper and 30 per cent. zinc, is also used for making condenser tubes, although sometimes a slightly higher percentage of zinc is used for this purpose, say up to 33 per cent., and similar metal is also sometimes used for cartridge cases. For the Admiralty, condenser tubes have a little tin added to the mixture, their standard proportions being 70 per cent. copper, 29 per cent. zinc, and 1 per cent. tin. In making condenser tubes the metal is first cast into tubes about 3½ inches external diameter, ½ inch thick. These tubes are then drawn down cold upon smooth mandrels several stages until they become of the finished size; each draw, with the exception of the last, is followed by annealing. The last draw leaves the tube "hard." The amount of "draw" or "pinch," or reduction of cross sectional area at the last operation is such as to leave the tube sufficiently hard to withstand the tendency to crush, owing to its being tightly packed in the tube plates, but not so hard as to be brittle.

As a surface defect on the inside of the original cast tube would not be entirely removed by the drawing process, it is usual to bore out the cast tube before any drawing takes place, and so produce a clean and good surface to start from. This, however, is not always done. The same alloy, viz., 70 per cent. copper and 30 per cent. zinc is used for making turbine blades. The process of making them, so far as the author is aware, has not been made public.

Condenser ferrules are made of an alloy containing a little more zinc than the condenser tubes. They are machined from tubes "hard" drawn, as for them hardness is a desirable quality, enabling them to be screwed up tight upon the packing without deformation.

The brass tube plates of condensers are usually made of "Muntz metal," i.e., an alloy of 60 per cent. copper and 40 per cent. zinc. For Admiralty work the mixture specified is 62 per cent. copper, 37 per cent. zinc, and 1 per cent. tin, and this metal is called naval brass. The tin is required, as it is thought that its presence assists in resisting corrosion. These plates are rolled hot.

Zinc and Alloy Strength

It has been stated that with these brass alloys greater strength is obtained with those containing a larger proportion of zinc. Many figures are given in different books of test results of the various brasses, their diversity is due partly to variations in the quantity of work put upon the metal, partly to the greater or less amount of annealing to which it has been subjected, and partly to the effect of impurities in the metal. Quoting the report on Alloys Research previously referred to, the alloy "with 40 per cent. of zinc elongates 40 per cent., with a strength of 23.8 tons per square inch. By adjusting the softening effect due to annealing and the strength produced by working, it is easy to increase the tenacity of bars and sheets to 38.09 tons per square inch, and to attain even greater strength in the case of wires."

In the same report there is a statement by Dr. D. Watson, the manager of the Broughton Copper Co., of Manchester, showing the effect of small quantities of impurities upon the strength and ductility of brass. He gives the following:—

	Tenacity per sq. inch tons	Elongation %
Brass containing 70% of copper and 30% of zinc.....	20 2	65½
Same brass, with the addition of 0.5% of iron	24.2	31¼
Same brass with the addition of 0.5% of iron and 0.1% of phosphorous	26.5	28

The above samples were thoroughly worked, and afterwards annealed before testing. Dr. Watson stated that the effect of iron was very marked, and that aluminum manganese and tin also had influence in increasing the tenacity and elastic limit, although they decreased the elongation.

Cold Working and Annealing

It has been mentioned that when much cold work has to be put on brass, as, for instance, in the manufacture of cartridge cases, seamless tubes, etc., the brass has to be frequently annealed. The temperature at which this takes place is of great importance. Law quotes some information from Mons. G. Charpy, which shows that when brass of 70-30 composition has been worked to its maximum condition of strength of over 30 tons per square inch, the full effect of annealing is produced by a temperature of 600 degs. C., which reduces the strength (cold) to 17.4 tons per square inch. Annealing below 280 degs. C. has practically no effect; at 420 degs. C. there is a marked softening effect, but the maximum is reached at the temperature stated above.

Some information as to the increase of tenacity due to cold work and also as to the effect of annealing at different temperatures was given by Captain C. Grard, of Paris, in a paper read at the Congress of the International Association for Testing Materials, held in 1912, at New York. He dealt with copper and also with brass containing 90 per cent. copper, 10 per cent. zinc, and brass containing 67 per cent. copper, 33 per cent. zinc, the latter being an alloy used for the manufacture of cartridge cases by the French War Department. He states that the brasses experimented upon were of good quality, very malleable when cold, but fragile and short when hot.

He further states that the effect of cold working was the same, whether produced statically (drawing and rolling) or dynamically (under a drop hammer), and that the effect of cold work was completely removed by proper annealing. In making experiments with drastic amounts of cold rolling, recourse had to be had to successive cold rollings without intermediate reheatings.

Although valuable properties are given to these brass alloys by cold work, such as increase of strength and of elastic limit, it must not be forgotten that the ductility is much reduced at the same time. When brass is subjected to much cold work it is liable to spontaneous fracture. Cases are not unknown of condenser tubes spontaneously cracking longitudinally, and of cold-rolled brass rods being found split after being stored for some time. Such occurrences are sometimes called "season cracking." The cause is to some extent obscure, but the fact that it occurs shows how unwise it would be to rely upon what may be termed an artificial strength produced by cold rolling for articles in which a failure would cause disaster. This is sometimes not sufficiently realized by engineers, who think they are securing a better article by specifying stringent conditions of high tensile strength and high elastic

limit which can only be obtained by cold rolling.

Useful information on the effects of cold work upon metals is given in the May lecture of 1914 by Professor E. Heyn, of Berlin, delivered at a meeting of the Institute of Metals, in which he shows that the internal strains are set up by cold working affecting the metal near the surface differently to that nearer the centre of the piece. He mentions that cold rolling and cold hammering produce tension strains in the core of the worked pieces, whereas cold drawing has the contrary effect, bringing about tension strains on the superficial layers and compression in the core.

Brass such as has been considered above is mostly used by marine engineers in connection with condensers, or as bolts and nuts, and is never used in details exposed to high temperatures. At high temperatures its tenacity becomes considerably lowered. In the Alloy Research Committee's report already referred to a table is given, from which the following is extracted:

Temperature.	Tenacity Tons per sq. inch.
20 degs. C. = 68 degs. F.	20.7
100 " 212 "	15.6
200 " 392 "	12.6
250 " 482 "	10.1
400 " 572 "	7.3
450 " 662 "	6.5
600 " 842 "	3.6
500 " 932 "	2.8

Tenacity of brass of composition copper 61.2 per cent., zinc 38.8 per cent.

Spelter, or Hard Solder

Another alloy of copper and zinc used in marine engineering is known by the names of "Spelter," and also "Hard Solder." It is used for brazing purposes. (Note the name spelter is also used to denote ingot zinc, but brazing solder is generally termed "spelter" by coppersmiths and engineers). This alloy is composed of copper and zinc, varying from 60 per cent. copper, 40 per cent. zinc, to about equal proportions of each, according to the purpose for which it is to be used; the higher proportion of zinc in any solder lowers the temperature at which it melts. During fusion, in brazing some of the zinc evaporates, leaving the solder on the finished article richer in copper than the original alloy. Hard solder is always made on a granulated form, which is obtained by casting the alloy into flat ingots. These are heated to a high temperature, judged by the color, and at this temperature it is very brittle. It is then pounded up into small pieces in an iron mortar. The broken pieces are sifted out to various degrees of fineness; the large pieces, if any should remain, are then repeated and repounded.

Pure Metal Essential

In making brass alloys it is important to use as pure metals as possible for the constituents. It has been stated that iron has a very marked effect upon the strength and ductility. Lead is often present in small quantities, being generally introduced along with the zinc, as much of the commercial zinc contains lead. It is, however, considered to be of great importance that the metal should not contain either antimony or arsenic, both of which may be introduced along with the copper. There is a workshop test known as the Muntz Metal test, practised in order to detect these impurities if their presence is suspected, either in copper or brass. A weighed portion of the copper or brass to be tested is melted in a small crucible and sufficient pure zinc is added to bring the proportion of copper and zinc to 60 40, the composition of Muntz metal. The resulting metal is poured into an open cast-iron mould, the quantity being sufficient to make a flat cake about 1 inch in thickness. This is allowed to cool. When cold it is nicked across with a chisel and broken. If the metal is good the fracture is fine and silky, but if even small traces of arsenic or antimony are present the fracture is different. The skilled workmen can in this way determine the proportion of either of these pernicious elements with almost the same precision as can be obtained in a chemical laboratory.

Copper, Tin, Zinc Alloys—Bronzes

We will now consider the bronzes, i.e., alloys of copper and zinc.

Pure bronzes, i.e., alloys of copper and tin only, are not much used by marine engineers, as almost invariably some zinc is added to the alloys, which in their various forms are usually misnamed either "brass" or "gun-metal." These alloys are used as castings, no forging work, either cold or hot, being put upon them. The reasons for their use for many purposes are the facility with which they can be cast to the shape required, their comparative resistance to corrosive influences, and their strength.

The alloy known as Admiralty gun-metal is composed of 88 per cent. copper, 10 per cent. tin, and 2 per cent. zinc, and this is without any doubt a very useful alloy. All kinds of boiler mountings, such as gauge cocks, feed and blow out and scum valves and chests, and the valves and seats of stop and safety valves requiring a strong and incorrodible metal, are made of this alloy. Sometimes where a little harder metal is required to resist wear, such as in some valves and valve seats, water gauge cocks, etc., the zinc is omitted and pure bronze is employed of a composition of 90 copper and 10 tin.

The addition of the zinc serves a very useful purpose in rendering the casting sound, besides the influence it has on the strength of the metal. When copper is melted and exposed to the air it rapidly oxidises, and molten copper has the property of dissolving the copper oxide so formed. When a bronze is melted both the copper and tin composing it are oxidised. The tin oxide is not soluble in the molten metal, but the copper oxide is; the tin oxide formed, therefore, remains on the molten metal as a scum, but the copper oxide disappears by going into solution in the molten metal. During the solidification of the metal at least part of the oxide becomes thrown out of solution and separated, and the result is a multitude of minute particles of copper oxide dispersed through the metal, which in consequence is more or less porous and unsound. If, however, there is a small proportion of zinc present, this metal has a greater affinity for oxygen than copper, and the copper oxide becomes reduced to metallic copper, giving up its oxygen to form zinc oxide, which, not being soluble in the fluid metal, rises to the surface in the scum. A small addition of zinc, therefore, permits a sounder casting to be produced.

Phosphor Bronze

A similar result may be obtained by the addition of a small proportion of phosphorus, which, as is well known, has a very great affinity for oxygen. When this is added to a copper-tin alloy the result is termed a "phosphor bronze." The phosphorus is added either in the form of phosphor-copper or phosphortin. Phosphor-copper is commercially obtainable in two forms, one containing 15 per cent. of phosphorus, the other 10 per cent., the latter melting at a lower temperature than the former.

If the precise proportion of phosphorus necessary to remove the oxygen is added to the bronze, the metal remaining is still called "phosphor bronze," although it will contain no phosphorus, but its properties are considerably better than those of a bronze not deoxidised.

Zinc is often used in the so-called "gun-metals" employed in marine engineering in considerably greater proportions than the 2 per cent. specified in the Admiralty mixture. It is sometimes said that the greater proportions are used because zinc is cheaper than either copper or tin. Lead is also often added, but not always with the view of making a cheaper mixture, as reference to Mr. Dewrance's research, to be presently referred to, will show. The addition of lead renders the metal less tough, and, therefore, more easy to machine, and for this reason it is, to say the least, not objected to by the machinists. It is also claimed for certain admixtures of lead that they render the metal more suitable for bearing purposes, by reducing the friction under heavy loads, and, especially in America, alloys containing considerable quantities of lead are used for bearings in heavy machinery.

Microscopic Structure of "Gun-Metal"

The microscopic structure of the so-called "gun-metal" used in marine engineering work is peculiar. When ordinary castings are being machined with a fairly rough cut the surface is seen to present a mosaic of ordinary yellow and of a rather lighter color. Each portion showing one color is a crystal with different orientation to its neighbors, and the crystals so shown are fairly large, their size depending upon the rate at which the casting cooled from its liquid condition. When a cut surface of the metal is carefully polished and suitably etched and examined under a microscope, it is seen that each of the above-

mentioned crystals is really composed of a number of "dendrites," arranged in regular geometrical fashion like the divisions of a fern leaf.

What happens in the cooling out of the metal is that the particles which first solidify are richer in copper than the average of the metal. They arrange themselves in a skeleton form of dendrites. Next to solidify are other particles not quite so rich in copper as the preceding, these arrange themselves outside those already formed, and the process goes on, the skeleton drendrites becoming more and more clothed with metal less and less rich in copper, and the portion of the metal which still remains fluid becomes relatively poorer in copper and richer in the tin or tin and zinc, until a point is reached at which it all becomes solid. The dendrites thus formed have been referred to by American metallographists as being of "onion" type, not because the shape is that of onions, but because it is formed of successive layers deposited on one another. Suitable etching of sections of the dendrites shows by the deeper colors of the centres that this difference of composition exists.

Where the copper is not more than about 91 per cent. of the composition the metal cannot well be worked either by hammer or by roll, either hot or cold. With greater proportion of copper than 91, especially when the metal has been deoxidized by phosphorus, some amount of work can be put upon it, and we have made in this way the so-called "phosphor bronze" rolled sheets which are used for air-pump valves, and which are hard and elastic. It is also drawn into wire for electrical purposes where high conductivity, combined with high strength and resistance to corrosion, are required.

Heat Treatment

In view of the peculiar onion-like, minute structure of gun-metal, it may be thought that it will be possible to modify its qualities by such heat treatment as will make the constituents diffuse into one another and become a homogeneous whole instead of remaining of diverse composition. Experiments in this direction were made by Messrs. H. S. Primrose and J. S. G. Primrose, and were communicated to the Institute of Metals in 1913. They experimented on metal cast in ordinary dry sand moulds, and also on samples cast in chill. Their tests included raising the metals to different high temperatures, keeping them at these temperatures for different lengths of time, and cooling some by quenching, and allowing others to cool out as in ordinary annealing. Their conclusions were:—

1—No improvement results from heating and quenching which lowers the strength of the material.

2—Simple annealing of the metals for thirty minutes very considerably increases its strength and elongation, the maximum results being obtained after annealing at 700 degs. C.

3—The homogeneity and other physical properties of the metal are correspondingly improved, but particularly the capability of the castings to withstand hydraulic pressure.

In the results quoted in the paper the unannealed dry sand casting had a tensile strength of 17.2 tons per square inch, and an extension of 24 per cent., whilst that which had been annealed for thirty minutes at 700 degs. C. had a tensile strength of 18 tons, and an extension of 37.5 per cent. With the "chilled" castings the improvement was still greater. It may be stated that the requirements of the Admiralty specification for gun-metal are a minimum tensile strength of 14 tons per square inch, and extension of at least 7½ per cent. in a length of 2 inches.

High Temperature Effects

Although "gun-metal" is extensively used for boiler fittings, and therefore exposed to temperatures as high as that of high pressure steam, very little information is available upon the strength and ductility of the metal. There has, however, long been an uneasy suspicion that high temperatures considerably depreciate its qualities.

John Dewrance in a paper communicated to the Institute of Metals, gives some valuable information on this subject, which shows that the suspicion was well founded. Good Admiralty mixture with a tensile strength of over 16 tons per square inch, and extension of 11 per cent. when cold retains its strength up to a temperature of 350 degs. F. (corresponding to a boiler pressure of 120 lbs. per square inch). At 375 degs. F. (corresponding to 170 lbs. pressure), its strength fell to 13.5 tons per square inch, whilst at 400 degs. F. (corresponding to 245 lbs.), its strength fell to 9.2 tons per square inch, and its extension fell to 1 per cent. At higher temperature the deterioration was still worse. Mr. Dewrance, however, found that the admixture of a little lead to the metal considerably improved matters. If the tin and zinc were retained at 10 and 2 per cent. respectively, and the copper was reduced by ½ per cent. and ½ per cent. of lead added, the extension when cold was a little lowered, but the tensile strength was not affected. At high temperatures, however, a great difference was found. No reduction of strength took place until a temperature of 550 degs. F. was exceeded, and the extension was continuously improved right up to this temperature. Mr. Dewrance made similar experiments with still larger proportions of lead. His conclusions were that ½ per cent. lead gave the best results, but even more than this still left the metal better at high temperature than that containing none.

Alloys Claiming Special Strength

Attention will now be directed to some of the alloys for which very special qualities of strength, etc., are claimed. They all are composed mainly of copper and zinc, and all or nearly all contain a proportion of iron, some of them contain one or more other components, such as tin, aluminum, manganese, or nickel. They are mainly proprietary articles, and their exact composition and the methods of making them are supposed to be trade secrets; their composition, however, can easily be determined by analysis. The fact that iron could be added to brass, and that its addition strengthened the alloy, has been known for very many years, and such metals have long been known under the names of "Sterro metal" and "Aich's metal." Law states that these two metals each contain 60 per cent. of copper, 38 per cent. of zinc, and 1.5 to 2 per cent. of iron, although the composition, so far as iron is concerned, varies within wide limits. This variation was due to the imperfect methods of introducing the iron.

Delta Metal

In 1883 Mr. Dick took out a patent for manufacturing an iron-brass, which he called "Delta" metal, by introducing the iron in the form of an alloy of iron and zinc, which could be obtained of reliable composition, other metals, however, were added. Law gives the average composition of Delta metal as copper 55 per cent., zinc 42 per cent., iron 1 to 2 per cent., with small quantities of manganese, aluminum, tin, and sometimes also lead.

Delta metal, like most of these iron-brasses, can be easily cast, and it is also capable of being rolled or drawn cold, and of being forged hot. It is also often "extruded." In this process, instead of being hot rolled from a billet, finished bars are made by forcing the highly-heated metal through dies by applying a great pressure by means of a hydraulic press. By such means bars of almost any desired cross section may be made, but it is not generally considered that the quality of bar so made is equal to that of bars of the same composition made by the ordinary rolling process. Extrusion may be applied to most of the alloys containing from 55 to, say, 60 per cent. copper.

Manganese Bronze

"Manganese bronze" is another of the alloys frequently used. It really ought not to be called bronze, but might, perhaps, claim to be called manganese-brass, although the amount of manganese in it is exceedingly small. This metal is used for castings, especially for propeller blades, and it is also forged when required and rolled into bars from which studs, bolts, valve spindles, etc., are made. It is made by several firms who all have their own ways of introducing the iron, the vital constituents, into it. The basis of the iron in the case of this metal is Ferro-manganese.

It has been stated that copper when melted dissolves copper oxide, which is an undesirable constituent. The manganese has great affinity for oxygen, and hence acts as a deoxydizer. It, therefore, sometimes happens that the whole of the manganese added in the ferro-manganese leaves the metal as manganese oxide, as, however, the iron remains in the metal the desired

strengthening quality is preserved. Ferro-manganese also contains carbon, which no doubt assists in the deoxydizing process. Some tin is usually added to the manganese bronze used for propeller blades, and often some aluminum as well.

Analysis shows that the iron is not always uniformly distributed through a large casting, the difference sometimes ranging to from 1.5 per cent. of iron to as much as 4 per cent., even when taken from contiguous parts of the casting. When a sample containing much iron is polished for microscopic examination minute hard spots are seen in it. These are thought by Mr. Dewrance and Arnold Philip, the Admiralty chemist at Portsmouth, to be particles of an iron in alloy, due to the iron alloying with the tin, and a greater proportion being present than can be kept in solid solution.

Many analyses of manganese bronze have been published, Law gives the following:

	Copper	Zinc	Tin	Lead	Manganese	Iron	Alum.
Cast	57 20	40 14	1 18	0 02	0 03	1 33	0 10
Rolled	62 45	36 00	0.63	0.06	0.02	0.84	....

It will be seen how little manganese there is in either of these alloys.

Law states that nickel is sometimes added to manganese bronze used for propellers, in order to prevent erosion. It is undoubtedly present in one alloy used largely for forging purposes, which, however, is not called manganese bronze by its maker.

The tensile strength and elongation of good rolled manganese bronze is about the same as those of ordinary mild steel. Like mild steel, when the bars are used for studs the material ought to be annealed in order to remove from it any possible effect of cold working. When bolts are made from it by forging, the heating in the process effectually removes this particular trouble, but if bolts are machined out from the solid bar, as they sometimes are, then the bars should be annealed, as in the case of studs.

Aluminum Bronze

Aluminum brass, or, as it is usually called, aluminum bronze, has sometimes been used for propellers. This is very similar to the manganese bronzes, and like them contains a small quantity of iron. The aluminum is added to replace a small part of the zinc, the copper contents not being much varied.

Cast manganese bronzes of the special types as made by various makers can be relied upon to have a tensile strength of from about 30 to 35 tons per square inch. They are, therefore, about as strong as cast steel, but they do not corrode so much as steel, and can be made with good surfaces. The influence of a smooth surface in improving the efficiency of propellers is now fully appreciated, especially in fast ships, and with high speeds of rotation. It need not be mentioned how much greater efficiency is claimed by makers of special propeller bronzes over ordinary iron or steel screws.

When so-called "bronze" propellers were first used it was found that the iron of the ships suffered from corrosion in their vicinity; if by chance the paint became injured, this was put down to galvanic action. This led to a different composition being used for the propellers. Now, more trouble appears to be met with in the corrosion of the propeller itself, and in some few cases very serious deterioration has occurred, especially in quick-running propellers, such as are used with turbine engines. To meet this, makers have in some cases again changed the mixtures, and "bronzes" are made which are claimed to be non-corrodible.

For yachts and small craft, which are built of wood and are copper sheathed, and in which iron or steel shafts are peculiarly liable to corrosion, forged "bronze" shafts of different sorts have been used, but it cannot be said with marked success, as all of the forgeable bronzes are copper-zinc alloys, and all seem to be peculiarly liable to a form of deterioration to which the term "dezincification" has been applied. Copper-tin alloys would probably be more durable, but they do not possess the strength of the copper-zinc alloys. It is with the view of preventing, or, at least, retarding this dezincification that the Admiralty require at least 1 per cent. of tin to be added to condenser tube metal, and to all brass exposed to the action of sea water. The question of the best metal for making screw shafts for wood vessels will soon be raised in view of the decision to build a large number of wood steamers in the United States.

BRITISH PRODUCTION OF STAINLESS STEEL PROHIBITED

THE production of stainless steel for cutlery in Great Britain has been prohibited by an order of the Ministry of Munitions, Sept. 8, 1917. The order reads as follows:

In view of the difficulties in getting supplies of ferrochrome I am directed to inform you that from the above date the use of the same in connection with the manufacture of stainless steel for cutlery purposes is prohibited. Ferrochrome must only be used in connection with high speed, crucible carbon steel and alloy steel and, in the case of the latter, only where a priority certificate or other permit number has been obtained which will warrant the manufacture of the steel in question.

As will be seen, the prohibition relates only to stainless steel for the cutlery trade and, therefore, such steel can still be made for other uses providing that these are connected with the production of munitions of war. That such uses exist is not generally known, but it appears that the material has proved extremely valuable for various engineering purposes, says an English authority. Apart from cutlery, steel rendered stainless or rustless by the employment of chromium in its composition is likely to become a big factor in the engineering industry of the future.

COMMITTEE TO AID SCIENCE BOARD

TWO sub-committees composed of scientists have been appointed by the Advisory Council for Scientific and Industrial Research and will assist that body in its investigations.

One sub-committee will deal with the subject of mining and metallurgy and will be composed of Dean Frank D. Adams, of McGill University, chairman; Prof. S. F. Kirkpatrick, Queen's University, vice-chairman; Major Chas. L. Cantley, acting works manager, Nova Scotia Steel and Coal Company; A. A. Cole, Cobalt, mining engineer for the Temiskaming and Northern Ontario Railway Commission; C. V. Corless, general manager Mond Nickel Company; T. Denis, superintendent of mines, province of Quebec; Charles Fergie, Montreal; A. R. Globe, assistant manager Hollinger Mines; Prof. George E. Guess, University of Toronto; Prof. J. C. G. Willin, Queen's University; E. H. Hamilton, Trail, B.C.; Prof. H. E. T. Haultain, University of Toronto; Prof. A. Mailhiot, Ecole Polytechnique, Montreal; E. P. Mathewson, Toronto, general manager British-American Nickel Corporation; Lieut.-Col. D. H. McDougall, Sydney, N.S., general manager Dominion Steel Corporation; J. G. Morrow, Hamilton; Prof. J. Bonsall Ported, McGill University; F. D. Reid, Cobalt; W. Fleet Robertson, provincial mineralogist, British Columbia; F. H. Sexton, president Nova Scotia Technical College; Prof. A. Starsfield, McGill University; John T. Sterling, chief inspector of mines, Alberta; R. H. Stewart, Vancouver; J. B. Tyrell, Toronto; O. E. S. Whiteside, Coleman, Alta. An associate committee in chemistry has also been named.

According to Prof. Thomas H. Norton, the cost of nitric acid made by the Birkeland and Eyde process of fixation of atmosphere nitrogen was but little more than half that of the acid from Chili saltpetre at 1914 prices, and by the Ostwald process, from ammonia obtained from cyanamide in the first place, even less than half. The production of ammonia in Germany by the Haber synthetic process, according to the Frankfurter Zeitung, rose from 30,000 tons in 1913 to 60,000 tons in 1914, 150,000 tons in 1915, and 300,000 tons (estimated) in 1916. An output of 500,000 tons of ammonia is anticipated in 1917, containing 100,000 tons of nitrogen; at the same time 700,000 tons of sulphate of ammonia (140,000 tons of nitrogen), and 400,000 tons of calcium nitrate (80,000 tons of nitrogen) are expected to be produced, the total including 320,000 tons of nitrogen.

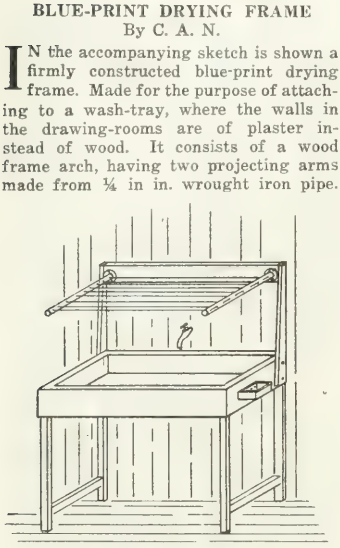
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

BLUE-PRINT DRYING FRAME

By C. A. N.

IN the accompanying sketch is shown a firmly constructed blue-print drying frame. Made for the purpose of attaching to a wash-tray, where the walls in the drawing-rooms are of plaster instead of wood. It consists of a wood frame arch, having two projecting arms made from ¼ in. wrought iron pipe.



BLUE-PRINT DRYING FRAME.

These are screwed into pipe-flanges and then fastened to the cross-piece as shown. Holes are drilled in the pipes through which is inserted a continuous length of cord on which to hang the prints. A small box fastened to the side of the tray will be found handy to keep clips in. These, when left hanging on the cords, as is often the case, sometimes fall off and injure the print while it is being washed.

HANDY CHART FOR DETERMINING CUTTING SPEED

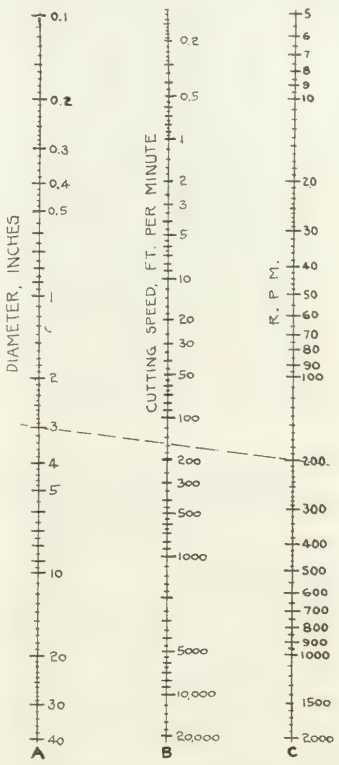
By N. G. Near

BY means of this simple chart any machinist can quickly determine the cutting speed of any piece from 0.1 to 40 in. in diameter by just taking out his watch and counting the rev. per min. of the stock, and by measuring the diameter of the stock in in. Then lay a rule across the chart and the middle column immediately gives the cutting speed in feet per minute.

For example, what is the cutting speed of a piece 3 in. in diameter when rotating at a speed of 200 rev. per min.? The dotted line drawn across the chart shows how it is solved. Connect the 3 (column A) with the 200 (column C) and the intersection with column B shows the cutting speed to be just a bit less than 160 ft. per min.

Of course, at the higher speeds it is not possible to count the rev. per min. "by hand" or mentally. The speed can be very closely approximated, however, by making note of the pulley sizes and speeds. Or, if you happen to have a speed counter, that, of course, will simplify matters greatly.

The writer ran across a good counting kink some time ago which does not seem to be generally known. In fact, I have never seen it written up. The idea is to count up to ten only, and then repeat the count, keeping tab all the while on your fingers. You can count much quicker than when you endeavor to



CUTTING SPEED CHART.

count straight along for the reason that you can go over the words "one, two, three, four," etc., much more quickly mentally than the words "twenty-one, twenty-two, twenty-three," etc. From one to ten all of the words are one syllable words whereas the farther along one gets the longer and more cumbersome are the words to pass through one's mind even though they are not spoken aloud. By counting to ten and then repeating over and over the writter has found it possible to count 600 r.p.m. with comparative ease. It is not necessary to count for a full minute. By keeping the eye on the watch and counting for 10 or 15 seconds a very close figure can be determined for the revolutions per minute.

This chart, it will be noted, has a very wide range—much wider than is ordinarily needed. Although the writer has never heard of a cutting speed as high as 20,000 ft. per min. it is inserted herewith nevertheless for we can never tell what will happen in the future. Stellite is doing cutting at amazingly high speeds these days. Perhaps something even speedier than stellite will some day be discovered. On the other hand it is hardly likely that anyone could ever endure the slowness of a cut that would creep along at the rate of 0.2 ft. per min., yet it is included in the chart because there is room for it and it may come in handy in some way or other although at the present time the writer does not see where.

Altogether the chart will be found to save considerable time, especially if the machinist has been accustomed to resort to the mathematical gymnastics otherwise necessary to arrive at the same results that may be obtained by simply laying a straightedge across the chart.

HOLDING WORK FOR INTERNAL GRINDING

THE unsatisfactory service rendered by the ordinary three-jaw chuck when used for manufacturing purposes was pointed out by James N. Heald in a recent article in Grits and Grinds. In most cases where such chucks are used, it will be

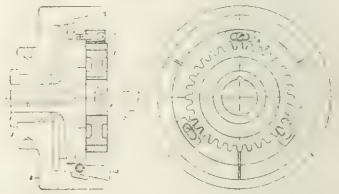


FIG. 1.

found that the time required for setting up is greater than for grinding, which is, of course, radically wrong.

A great amount of study has been given to the design and operation of various type of chucking fixtures to reduce the time required for getting the new piece in proper position for the grinding wheel. The attention given this matter usually accounts for the difference in production of one shop as

compared with another on exactly similar work.

For instance, in chucking gears one shop will equip its machine with a high grade type of gear holding chuck, in which the gear is trued up instantly by a method of pitch line control in combination with a drawn collet which takes but a moment to operate. In another shop the chucking method will be so crude that a similar gear will be held in a three-jaw chuck and the operator will either true it up with a piece of

FIG. 2

FIG. 3

chalk, or some other device which will require a longer time than is required for both the chucking and the grinding of the gear when using a properly designed fixture.

There are three methods of chucking gears in use:

First, holding the gear by the outside diameter, or tops of the teeth.

Second, holding the gear with jaws of special shape, making contact with the gear at the bottom of the tooth space, and known as root control.

Third, holding the gear by using rolls between the teeth, sometimes called pitch line control.

In regard to these methods, first, the outside of the blank is very often not exactly true with the hole and even if it should be, the teeth will sometimes be cut eccentric if the arbor does not run true in the gear cutter, or if the gear is a loose fit on this arbor.

Still another chance for error occurs when a string of gears is cut at one time and the hubs are not absolutely uniform in thickness at all points, because the clamping of these together will tend to spring the arbor on which they are mounted, especially if its diameter is small compared to the total length of the hubs, and the gears in the centre of the string will then be cut eccentric, both as regards the hole and the outside diameter.

For this reason, holding gears by the outside diameter is not a satisfactory way to locate for grinding.

The second method, which has been used to some extent, is based on the principle of having the holding jaws make contact at the bottom of the tooth space and has certain advantages.

This method is illustrated in Fig. 1 which shows a jaw having two contact points reaching to the bottom of the tooth space. According to this method it does not matter whether the outside diameter is concentric with the cutting of the teeth or not, as this surface is not used. It is a simple matter to maintain the accuracy of the jaws because the points which make contact with the gear can be trued up occasionally with the grinding wheel used in grinding the hole, and, of course, does away with the continual truing up of each gear individually in chucking.

The disadvantages are that sometimes gears are roughed out with what is known as a stocking cutter and this cutter may go to a depth beyond the point reached by the finishing cutter and in that case, of course, the surface which these jaws would make contact with would not be exactly right.

Another difficulty is that the bottom of the tooth space has usually rather large rounding corners and very little flat surface for the jaws to come against and this makes it difficult to locate the jaws so that points will not ride up on the rounding corners and give inaccurate results.

We therefore favor the third method, namely, that of pitch line control, for securing the best results, and it is the writer's belief in the great majority of cases that a properly designed fixture working on this principle will give results of the highest grade and be most satisfactory in everyday service.

While such chucks have been designed using three rolls around the circumference of the gear, as in Fig. 2, it has been our experience that a larger number is far more desirable and gives a better average setting, and we therefore recommend a larger number running from five rolls with small pinions having from 12 to 15 teeth, to nine rolls with gears having say, 40 or 50 teeth, the number used always being odd, like 5, 7 or 9.

FIG. 4

A very successful form of chuck of this type is illustrated in Fig. 3, arranged in connection with an ordinary draw-in-collet chuck. This cut shows a number of rolls, nine in fact, arranged around the circumference of the gear, each collet in this case supporting three rolls. These rolls are carried loosely in a light metal ring, or retainer, which allows the rolls to enter freely between the teeth of the gear and come to a firm bearing on the machine surface.

The tapering ends make it easy for the rolls to be inserted between the teeth and also to easily enter the chuck along with the gear.

The rolls can be fastened to the collet jaws if preferred, but the mounting of the rolls in the retainer ring as shown in this cut enables the operator to more easily keep dust and grit from getting behind the rolls where it would be likely to affect the accuracy of the chucking operation.

To maintain the accuracy of the chuck, the face of the blocks behind the rolls should occasionally be reground to a true surface.

Chucking Bevel Pinions and Gears

Figure 4 shows a method of holding bevel gear blanks by the use of three sets of taper rolls located at three points around the circumference of the gear to enter the spaces between the teeth and locate the gear in the correct position according to the pitch line.

These taper rolls can be so designed as to make contact the entire width of the face of the gear by having the correct relative proportions as to diameter and taper. This makes an extremely accurate device for holding bevel pinions, and if quiet running and high grade results are desired the chuck will quickly repay the cost of manufacture.

Fig. 5 illustrates an excellent method of holding large bevel gears, such as are used in automobile transmissions. According to this method an unhardened gear (as shown at 2) is mounted on the face plate, which can be recessed slightly to center this master gear so that it will run perfectly true. The gear to be ground is turned with its face to the master gear, and held by three clamps (as shown at 4). It is a good plan to cut back a portion of the teeth of this master gear, as shown in the cut at the right of 5, leaving full length teeth, as at 6, at three points in the circumference.

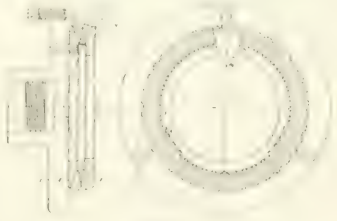


FIG. 5.

The gear to be ground will then run true, and will not rock on its support because of the three points of contact, and the teeth of the gear will run as true as it is possible to make any gear of this character.

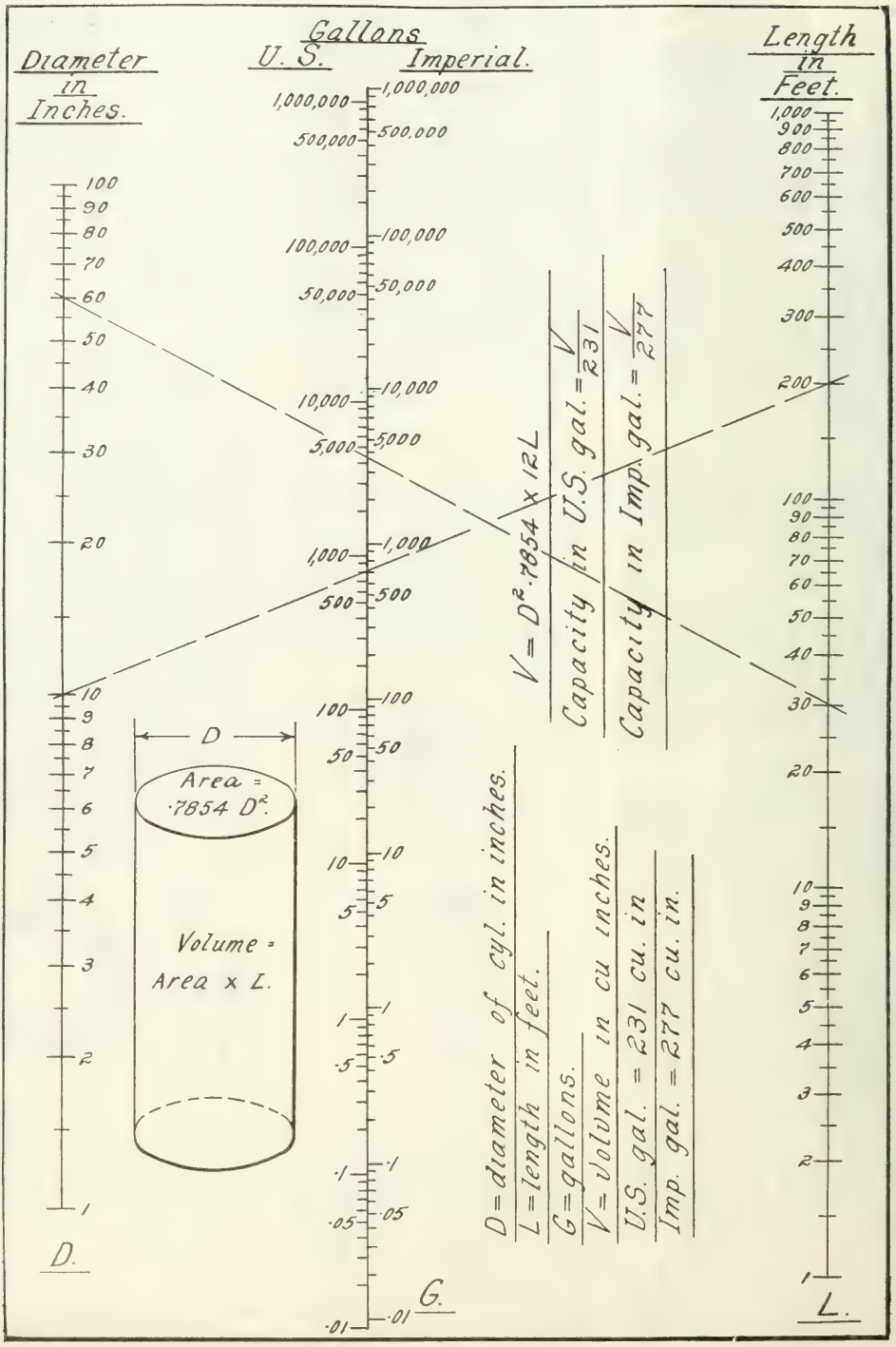


CHART OF CYLINDRICAL TANK CAPACITIES.

CAPACITY OF CYLINDRICAL TANKS

CALCULATIONS for the capacity of cylindrical vessels are often tedious work to those not very familiar with the method by which these results are attained. While many handbooks can be had that give the tables for the various capacities for certain diameters, it is invariably the case that the time occupied in securing the desired information is greater than would be required to figure it out. It is well, therefore, to learn the principle by which these mental problems are solved. Generally speaking the capacity of a vessel is computed in gallons, while the dimensions are invariably given in feet or inches, and it is, therefore, necessary to determine the volume of the interior and find the corresponding capacity for such a volume. The volume of a cylindrical vessel is found by multiplying the area of the base by the length or height. The area is .7854 times the square of the diameter; for instance, it is desired to find the volume of a cylindrical tank 15 feet in diameter and one foot deep. The area of the base would be $.7854 \times D^2 = .7854 \times 15 \times 15 = 176.7$ sq. ft., and one foot in height would give a volume of 176.7 cu. ft. One cubic foot of water contains 6.23 Imperial gallons or 7.48 U.S. gallons; therefore the capacity of the above tank in Imperial gallons would be $6.23 \times 176.7 = 1100.8$ Imp. gallons. In United States measure the capacity would be $7.48 \times 176.7 = 1321.716$ U.S. gal. In smaller tanks where the diameter is usually given in inches and the respective volumes of an Imperial and U.S. gallon are 277 and 231 cu. inches, it is customary to use these latter values in calculations.

A cylindrical tank 60 inches in diameter and 30 feet long would have a volume of $.7854 \times D^2 \times L. = .7854 \times 60 \times 60 \times 30 \times 12 = 1,017,878$ cubic inches. The capacity in English measure would be $1,017,878 \div 277 = 3674$ Imp. gal. In U.S. gal. the capacity would be $1,017,878 \div 231 = 4406$ gal.

To convert Imperial gallons to United States gallons multiply by 1.2; thus, in the above example $3674 \times 1.2 = 4408$ U.S. gal. To convert U.S. to Imperial multiply by .833.

$4406 \times .833 = 3671$ Imp. gal. The small differences in the values result from the slight error in decreasing the number of decimal places in the constants 1.2 and .833. These constants are derived from dividing the respective volumes by each other; as 277 divided by 231 gives 1.199, and 231 divided by 277 gives .833.

It is often possible that an approximate value is sufficiently accurate for tank capacities, and for this purpose the accompanying chart will be found of great service. On the graduated scale D, to the left, are given the various diameters of tanks in inches, and in the right-hand column L the length in feet. A straight line drawn from any two points on the two outer scales will interest the middle column G at the approximate capacity in U.S. and Imperial gallons.

AN EMERGENCY SHRINK FIT

By J. H. R.

IN order to make a satisfactory shrink fit, it is necessary that the shaft be slightly larger than the hole into which it is to be placed; however, some time ago I had occasion to see a fit of this kind made where the part has been used as a running fit, and the result was all that was expected and answered the purpose very nicely. A piece of light tin was secured and cut to a size equal to the length of the hole and a width equal to the circumference of the shaft; the bracket containing the hole was then heated to a dull red and placed over the thin tin bush, so that when the outer portion cooled off, the fit was almost as good as if the contact had been made between the shaft and the bore. To assist in keeping the shaft perfectly tight, a pin was driven into a drilled hole, but after several week's service, no slackness was apparent.

BENCH LATHE KINKS

By G. C. White.

KNURLING is a simple operation which, however, needs to be carefully done. The appearance of nice work is often spoiled by poor knurling or the time required to do this class of work is exceeded in setting up. In performing this operation

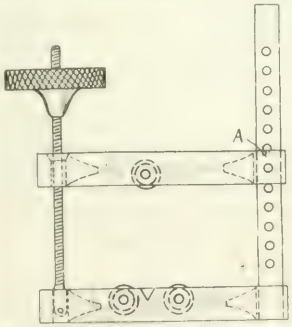


FIG. 1. HAND KNURLING DEVICE FOR BENCH LATHE.

on a lathe it is customary to place a tool in the cross slide holder and force the knurl radially into the work. This procedure necessitates setting the tool square with the work, and if the work is long and slender it may spring and consume considerable time, or if the tool

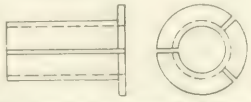


FIG. 2. SPLIT BUSHING FOR USE IN REGULAR COLLET.

was not squared up, the appearance will not be pleasing to the eye. The Acme screw machine equipment includes a knurling tool holder where the knurls are placed one above the other, and the work is located between the rolls, which makes the pressure of the one equalize the pressure of the other. This permits of knurling the full depth at one time.

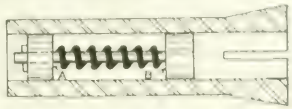


FIG. 3. SPECIAL COLLET WITH SPRING STOP FOR REPETITION WORK.

A knurling tool of this type for bench lathe work, one which is efficient, requiring a minimum of time to set up and perform the operation, is illustrated in Fig. 1. Two rolls are cut right-hand and one left-hand. The pressure is counterbalanced and is adjusted by the knurled clamping nut. The tool is held in the hand and the speed of the machine is slightly reduced. The distances between

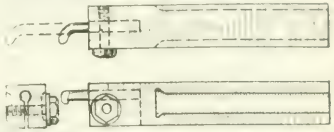


FIG. 4. SIMPLE TYPE OF BORING TOOL.

centres of the rolls can be varied to suit any diameter of stock up to 1½ in. by drawing the pin A and inserting it in the proper hole. Kerosene used freely keeps the work and knurls cool and free from cuttings. One cut is sufficient, but sometimes it is necessary to traverse the work twice if the steel is hard. The angle of the cutting teeth should be varied to suit the quality of the metal being cut, but the details given in the tables have been found satisfactory for ordinary work on steel and drill rod.

	Fine Knurl.	Coarse Knurl.
Dia. inches	.58	.60
Lead, inches....	2.50	2.78
Number of teeth	50	47
Angle of cutter.	45°	45°

Collet Kinks

An improvised collet can be made quickly by inserting a split bushing in an ordinary collet of larger size. it frequently happens that some other fellow has the collet that you require in his lathe, or that you are using some drill rod which the collets on hand in the tool stores will not suit, and to hold up the work long enough to make a regular collet would be impossible, to say nothing of the expense for possibly a small job. These split bushes, as shown in Fig. 2, can be made up to suit the odd sizes, and they will save many steps and temporary hold-ups.

The collet shown in Fig. 3 is for use on machines employed on bench lathe repetition work requiring that the back face of the work be gripped in the collet, so that the axis of work is parallel to the axis of spindle. The block or plug A is a pressed fit for the bore of collet, and the block B is a sliding fit. The work is

pressed against the face of the sliding block compressing the spring. The collet drawback is tightened, and after the operation has been performed the spring will force the work out of collet when the drawback is released.

The boring tool illustrated is simple and hardly needs describing, and yet it is astonishing how many boring tools are made with adjustments to permit of boring different sized holes by adjusting a thumb nut. These latter bars I have not found satisfactory, in that they are not rigid enough for fast work. The tool is a piece of drill rod and the bar is split at the end, the tool being held by the clamping nut, which pinches the split portion of bar together.

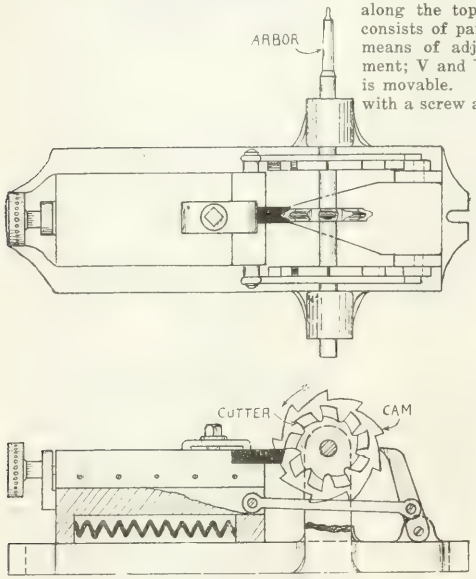


FIG. 5. RELIEVING ATTACHMENT FOR USE ON BENCH LATHE IN MAKING SMALL CUTTERS.

Fig. 5 illustrates a relieving attachment for small cutters. The attachment is placed on the lathe bed, arrangements having been made in the course of manufacture to provide means of locating the spindle in line with the lathe spindle. The jig spindle is inserted in the lathe spindle and the sketch is self-explanatory. The economical feature of this little jig is that it does away with the tying up of a larger machine.

Automatic Feed Device

In Fig. 6 is shown an automatic feed attachment for a bench grinder. This mechanism fits on the lathe bed just back of the regular grinding attachment, and it is secured in the T slot by means of the T bolts (A), which are tightened by eccentric bolts through the holes and into the housing at the back. The pulley C with the pin H is kept out of mesh by means of a spring, and when it is desired to use the jig the eccentric lever I forces the pulley and pin back against the U slot in end of shaft which it rotates. To this shaft is fastened a worm, which engages with a worm gear attached to a heart-shaped cam D. This cam transmits motion to a lever E, which transmits it to another lever F. Lever E has a means provided to adjust the location of its centre, which varies the stroke of the contrivance. The reciprocating arrangement, which rests and slides along the top of the rectangular box, consists of parts U, V, Y, which provide means of adjusting the relative movement; V and Y are tied together, and U is movable. This movement is obtained with a screw actuated by the knurled nut Z. The brass disc W butts against the handle of the grinder attachment and gives it the rectilinear motion. If the grinding attachment is swung at an angle, the small discs are swung to suit. Two of these machines can be operated by one man, and it is obvious that, on certain classes of work, there is considerable economy to be gained.

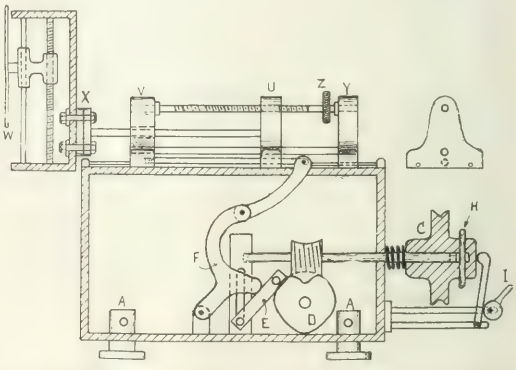


FIG. 6. AUTOMATIC FEED ATTACHMENT FOR BENCH GRINDER ON LATHE.

FUEL SHORTAGE LIKELY IN COMING WINTER

THE following memoranda indicate that there will be a greater coal shortage next winter than last, and, therefore, we should arrange for our fuel supply accordingly:

1.—Great Britain is short 15,000,000 tons of coal; France lacks even more; the coaling of Allied warships on the Atlantic coast, the naval, domestic and industrial requirements incidents to the entrance of United States as a belligerent, all mean that the coal production must be increased.

2.—United States officials anticipate that next fall there will be unprecedented demands on rolling stock as well as greater difficulty in handling the production.

3.—The situation is that the United States companies have placed an embargo on coal going out of that country, and the United States desires to keep coal cars in that country for any emergency that may arise.

4.—The present rather acute shortage of coal in many quarters will not be helped by war conditions in the United States.

5.—Coal prices have generally increased, and, unless there is Government regulation, they will reach higher levels.

6.—The U.S. Geological Survey, as well as other agencies having knowledge of the facts, is urging all consumers of coal, both large and small, to store their winter's fuel during the summer months.

In so far as central and western Canada is concerned, the situation is intensified by the fact that owing to the coal strike in the West some 200,000 tons has already been lost from production this year; also, owing to the shortage of ships and the great demand for iron ore for the manufacture of munitions, much less coal than ordinarily was brought up the Great Lakes last year, so that there are practically no supplies on hand.

From the above it is evident that, to be assured of our winter's supply of coal, and, at the same time, save inconvenience and perhaps higher prices, we should buy coal during the summer months wherever and whenever it is available.

The Dominion Government has appointed a Fuel Controller to take charge of the situation, and the coal dealer and householder can assist by filling their bins now with sufficient coal to last through the whole winter. By so doing they will help out conditions when the railway congestion occurs next fall.

Quebec.—The big dry-dock at Quebec on the St. Lawrence is now nearly completed. The boilers and machinery have been tested, the new gates are in position, and the coffer-dam, or false gate, blown up. Within a few weeks it is hoped to fill the dock for the first time, but as the approach has not been thoroughly sounded, it is not expected that any ship will enter the dock this year.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

A FEW NOTES ON PRODUCTION

By Chief Examiner

THE first aim and object of the manufacturer of any article, is obviously "production". To make the goods in sufficient quantity, and with the least expense is of course his principal endeavour. Just how to accomplish this end is often the cause of a great deal of worry, and, in many cases, of loss of sleep to not only the head of the firm, but to his superintendent and foreman.

After all, it is not such a big matter as it would seem to be. There are many points which the head of a firm should look to. Among those we might select first, machinery; second, organization; third, quality.

In discussing those three points, it must of course be taken for granted that the order for the goods is there and that suitable premises for their manufacture are in the possession of the manufacturer. The same principles apply to the making of all articles, but for the sake of the argument I propose to choose the making of 4.5 high explosive shells as the base, from which will grow the "production."

Machinery

The first point is the machinery. It is far better, and more economical in the long run, to procure new machines rather than old, or even second-hand ones. To get a true bore the boring lathe must be on a solid bed, and all parts must be tight. The same applies to the eccentric turn, the finishing turn, the milling machine, and all others.

Then the speed at which the work revolves must be just the right speed at which the greatest number of shells can be turned out at the required standard of efficiency.

One very important thing, under the head of machinery, is the question of tools. A superintendent should see that a duplicate set of tools for each and every machine is always on hand. He should further see that those tools not in actual use are always kept in a properly sharpened state so that the work is never stopped because of defective tools. He should also make a point of having two or three machines always ready so that, in the event of a breakdown, he can transfer the work to one of the auxiliaries. There should be a machine for every operation, and each individual operation should always be moving—never still. Much could be said from the machinery point of view, but there are probably more important points to be gained from the second phase viz.:

Organization

Organization or system, is undoubtedly the life of a factory. If it is not, it should be; for without it the firm might just as well go out of business first as last. The first thing to do is to pay good wages—not on an exorbitant or fancy scale, but sufficient to be fair and just according as the man is fair and just to his employer. Start him at a low figure, then, immediately you see he is showing an interest in his work, raise his rate and keep it raised. Don't cut a man because he is turning out a large number, but—and this is important—insist that all work that has to be rectified from his machine is done by him—for nothing. If you find him "banking," fine him at once. Make it perfectly clear that all work done in a day must be booked for that day, and not carried on to the next. In many cases the day operator "works it" with the night man, then, of course, the night man repays the favor, at a cost to production.

Watch carefully for spoilages. Sometimes you will find them dumped outside a window or hidden in all sorts of corners. This brings up another point to consider. Once every week have a clean-up. Bring all the rectifications up to date—I refer to the earlier operations in the making of the shell. If you have many "eccentrics," get them put through by "drawing the centre" and don't hoard them up. If they are too bad send them back to the steel plant as soon as possible. Any shells that develop flaws, seams, etc., should be put into storage to await the steel man, but—clean your floors thoroughly every week.

The Importance of Plant Layout

A good point to emphasize is the laying out of a plant. Have all the operations follow one another consecutively and eliminate trucking and carrying as much as possible. Some firms do two or three operations on one side of the factory and the fourth away across on the other side. This is not only silly, but a great loss of time and production.

Divide the entire manufacture into three parts; one, from the commencement to, say, the preliminary shop inspection bench; the second, from there to the final shop inspection bench; a third from thereon the shipping room to the shipping of the shell. The superintendent would of course be boss over all, but under him one foreman could control the 1st part, one the 2nd and another the third. Under the 2nd, or machining part there should be one man to run a machine equipped for rough-ing and one to do another man to handle the projection from the [illegible] room—or more if necessary. This foreman in the 2nd section will have plenty to devote their attention to keeping the work going, and should supervise everything that has to do with the machines and the operators, making their first endeavour that of getting the greatest possible number of shells through per day.

Shop Inspection

A very necessary department, however, is that of shop inspection. There should be an efficient chief shop inspector having under his personal control a staff of inspectors. These should have full control of the quality of the work and should be placed at various points to enable them to supervise each operation. There should be one inspector at the bores, who should control the shell from the rough turn to the base cut off. Another should take charge of it through the nosing press, and watch that the proper heat is given.

One man should inspect every shell that is finished in the interior profile to see that the tool has not worn. If it does so, a ridge is almost sure to develop. Another inspector should take charge of the finished turn, first weigh, and transference of the heat number from the base to body. He could also take in the "waver"—the machine that cuts the driving band recess and wave ribs. Hogging the base recess and finishing the same is a simple operation which the chief inspector could keep his eye on.

Then there are the preliminary and final shop inspection benches, which should have sharp experienced men at them, men who will act without fear or favor. One inspector should look after the nose operations; another, the base plates and bands; and yet another, the varnish and paint. If all those inspectors do their work properly and remain impervious to, and fearless of threats, inducements, or favoritism, there is no reason why shells of high quality should not be produced in large numbers.

Quality the First Aim

This brings us to the third point—that of quality, which should be your first consideration as an employer or foreman. There is a government man on the job, who, if he does his duty, will insist on a certain standard. It is of no use for a manufacturer to expect to "get things passed" which do not conform with the wishes of this autocrat—for such he undoubtedly is. What is the use of sending in shells which are faulty for government inspection?

Take an instance of loose base plates. It is not only perfectly easy, but obviously the proper thing, to find that they are loose at the base facer. If the shop inspector is attending to his work, not more than six loose plates

should pass him without the matter being reported and rectified.

The same thing applies to high or low or loose bands, the threads in the nose, the fuse hole recess, the container seat, and in fact every detail.

Co-operate With Government

Faults should be detected and rectified by the shop before going to the government room. Government rectifications mean double work for every body concerned and never fail to cause friction between the inspectors and shop. Some firms work on the principle of "Let it go through; take a chance on it; they will not see it." This is very foolish indeed because "they" always see it.

Another foolish thing is for the shop to argue with the government man and try to make him out to be wrong. He is only human, and can make mistakes, but he demands a standard and he will get it, no matter how much argument is offered.

It is not wise for the manufacturer to be continually asking for "rulings." Make your shells properly and you will not require them.

Still another word of advice—never try to work the government production department against the government inspection department. This has often been tried and always fails. These two departments work hand in hand with one another and it always works out, in the long run, that the production department favors inspection, and the inspection department favors production, but each attends to it's own business first.

Now, Mr. Manufacturer, the boys at the front want shells, shells, shells. Produce to your limit—ave above your limit, if possible. Attend to your tools! Organize! Make a system and stick to it. T . . out a first-class article. Give equal attention to quality as to dollars and cents and don't quibble. You make the shells, and the dollars and cents will fall on you in showers, but cut out fighting inspection.

PROSPECTS OF COMMERCIAL AERONAUTICS

THAT the development of the aeroplane business after the war will take place on sound, rational business lines, is the opinion of C. G. Grey, editor of *The Aeroplane*. In a recent article contributed by *The British Trade Review*, he quotes present conditions and outlines what he considers as very certain probabilities of the near future.

Obviously aircraft will be of the greatest use in those countries where the land is least served by railways and roads, such as the great plains of Canada, the United States, South America, Australia, Africa, and Asia. The great feature of the aeroplane is its high speed over the ground. But this high travelling speed is counterbalanced by delays in starting, merely because one cannot have a big aerodrome in a big city. At present, if anyone wanted to run an air-line between London and Birmingham—a matter of 110 miles, and therefore about an hour's flying—he might use the Hendon Aerodrome as his London terminus and the Castle Bromwich Aerodrome as his Birmingham terminus. It would take about an hour for passengers to get to Hendon by taxi from anywhere in London proper and get started, and it would take them pretty near an hour to get into the heart of Birmingham from Castle Bromwich. Therefore the "house-to-house" journey would take three hours, whereas a train only takes two hours from Euston to New Street, which stations are within a quarter of an hour by taxi of anywhere in their respective cities where most travellers would wish to go.

A Great Achievement

Over a long journey it is quite another story, for then the high speed of the journey itself more than makes up for terminal losses. For example, London to Paris has been done over and over again in less than three hours by real passenger machines. In one case a Handley Page biplane, carrying a pilot, six passengers, and 900 lb. of luggage (150 lb. per man, or just about first-class allowance), flew, from an aerodrome not far from London, to Paris in 2¼ hours. Now the best trains used to take three hours for the Paris to Boulogne run, after which there was all the trouble of transhipping at Boulogne and Folkestone, and the whole journey used to take something like seven hours.

Another aspect of present conditions is shown by the case of a ranch owner in the Argentine who considered it would be a good idea to inspect his property once a week by aeroplane, instead of once a month on horseback, and at much less trouble. He came into Buenos Aires the typical ranchero, bought an aeroplane, and started to learn to fly at the local aerodrome. In a few months the local aviators found he was a very good flier, and so presently the shy but farsighted ranchero became a popular hero of the air, and quite one of the "knuts," so to say, of Buenos Aires. Anyhow, he did not do any ranch inspecting by aeroplane.

How To Buy An Aeroplane

But after the war all that will be quite different. There will be hundreds of big aeroplane firms run by sound business men, and they will go about their business in a proper commercial manner. Take my Argentine friend, for example. Instead of going to the local aerodrome and being lost in the whirl of the gay city, he, or his kind, would merely write to a few aeroplane firms whose names they had seen in the aeroplane papers, and after a little paper negotiation a representative of the firm would fly to his ranch to see him, and would probably pilot him round the various outlying stations to show how it could be done. Then, if the ranchero decided to go in for an aeroplane, the firm would either supply him with a chauffeur or would send an instructor down to act as chauffeur till the owner himself could fly well.

To take a bigger example, suppose a colonial Government wanted to buy a dozen aeroplanes, and perhaps two or three airships, for commercial purposes—which would, of course, include post office work—after the war, they would presumably go to their local aviators for advice. The local aviators, having probably flown in the war, would all have their particular likes and dislikes of different aircraft manufacturers' workmanship or design, and so the colonial authorities, being mostly English, would form a committee to talk it over for a few months. In the meantime the local aviators would probably each have written to some friend in England about it, and so one or two enterprising manufacturers would have heard about the proposition. They would promptly send representatives out with sample machines, "just exactly what you want for your special conditions" kind of thing. And very probably the colony would get what it wanted.

A Topeka business man employs two negroes to work on his gardens, which he personally oversees. One morning Sam did not appear.

"Where is Sam, George?" he asked.

"In de hospital, sah."

"In the hospital? Why, how did that happen?"

"Well, Sam he been atellin' me ev'ry morning' foh ten days he gwine to lick his wife 'cause o' her naggin'."

"Well?"

"Well, yestiddy she done ovarheah him, da's all."

Critics of the lack of reverence on the part of modern youth take considerable pleasure in relating the story of a certain Middle West boy who was hearing for the first time the cherry-tree-and-hatchet story. It was very dramatically related by a patriotic aunt, but Louis was not so deeply interested as he might have been. When the climax was reached and George Washington said, "I can not tell a lie," Louis displayed his first glimmer of enthusiasm. "Couldn't he?" he asked. "What was the matter with him?"

A lady rang up the club the other evening.

"Please call my husband to ——," she began, but she was interrupted.

"Your husband ain't here, ma'am," said the attendant, blandly.

"My goodness gracious me!" the lady exclaimed. "You're mighty sure about it, aren't you? And I haven't told you my name yet, either. Look here, mister, how do you know my husband isn't at the club when I haven't told you my name?"

The attendant answered more blandly than ever:

"Nobody's husband ain't never at the club, ma'am."

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

INTERNAL ROTARY CUTTING-OFF MACHINE

THE machine illustrated in the accompanying engraving has been specially designed to satisfactorily perform the extreme duty demanded in such work by rolling mills, car and locomotive works, navy yards, engine builders, electrical machinery builders and machine makers generally, and is capable of being operated constantly with a minimum cost of repair.

The machine is of lighter weight than those hitherto built by the makers, George Gorton Machine Co., Racine, Wis., the heavier type having been developed over a period of several years and largely adopted in shell manufacture. The present design is suited for work on 1 in. to 4½ in. rounds; 1 in. to 3¼ in. squares; and for any other shape or size which can be contained within a 4⅛ in. circle. Figs 1 and 2 show the exterior of the machine from either side, while the cutter blade and cutter grinder are shown in Fig. 3.

The internal tooth type of cutter blade, see Fig. 3, has a capacity for heavy feeds not possible with other types of construction. The cutters, being on the bore of the blade, may be keyed in very rigidly without distorting the blade, as the effect of the arrangement is equivalent to a heavy band surrounding the cutters, and securely fastened around its periphery to a heavy cutter drum. It will not deflect and snake and stock is thereby cut off squarely.

The drum bearings are of the same special vee type as used on the larger machine, and are quickly adjustable after wear even over many years. The blade is made of chrome vanadium manganese steel, is heat treated, and ground on both sides after rough milling the cutter pockets, after which a light cut is taken to finish the pockets to size, insuring a blade accurately made, and with no strains tending to throw the cutters out of alignment.

Cutters are made from a fine grade of high speed steel, accurately machined and carefully heat treated. They are alternately wide and narrow, the narrow cutter projecting a slightly greater distance toward the center of the blade than the wide cutter. The narrow cutter cuts out the metal in the center of the cut and te wde cutter cleans up the corners.

The automatic power feed mechanism, which is adjustable, is of a new type, designed to obviate the necessity for the operator to reverse any clutches when ready to raise the cutterhead to position after finishing a cut. The handwheel is used to adjust the cutterhead either up or down as it automatically disengages the feeding pawls when raising the cutter head, allowing the screw to be turned in the opposite direction. A large spring under the cutterhead acts as a counterbalance taking the weight off the screw.

Oiling is practically perfect. The main gear and pinion bearings, as well as the drum bearing, run in oil, this supply also oiling the pinion shaft bearings. The working parts and ball bearings of the feed mechanism are submerged in oil making them practically wear proof. The only other bearings are those of the pump which are lubricated by grease cups.

A high grade friction clutch is incorporated in the machine so that it can be driven direct from the line shaft, doing away with countershaft, and overhead belt shifters. A geared pump for delivering lubricant to cutters is furnished with machine, together with strainer, check valve and all necessary piping. All belt driven machines are arranged so that motor drive may be applied at any time, a 3 h.p. D.C. variable speed mtor of 900-1800 r.p.m. If a

FIG. 3. LEFT: CUTTER BLADE SHOWING METHOD OF INSERTING CUTTERS. RIGHT: CUTTER GRINDER WITH SPECIAL FIXTURES FOR SHARPENING CUTTERS.

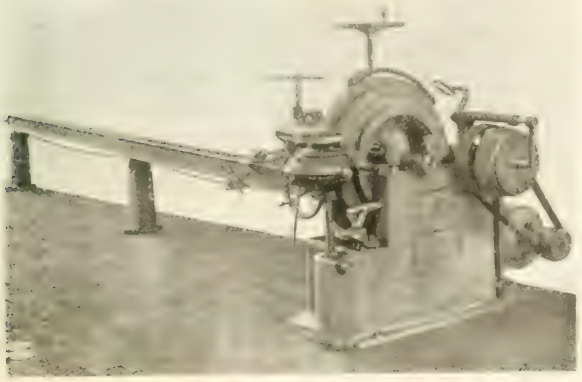


FIG. 1. INTERNAL ROTARY CUTTING OFF MACHINE FOR HEAVY DUTY WORK OF MEDIUM DIMENSIONS.

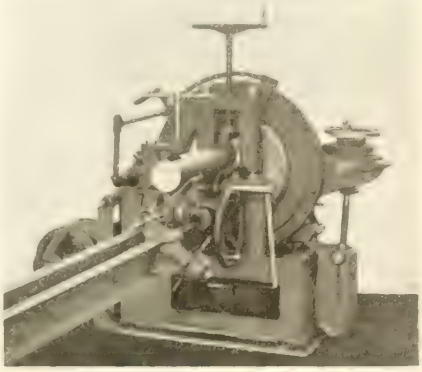
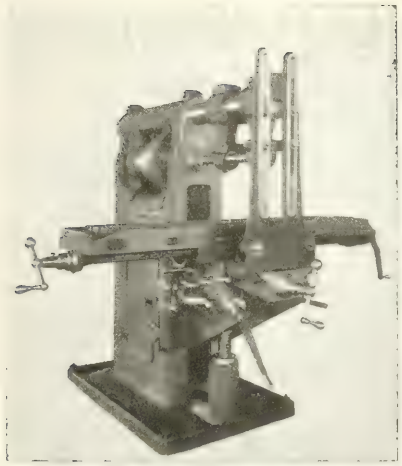
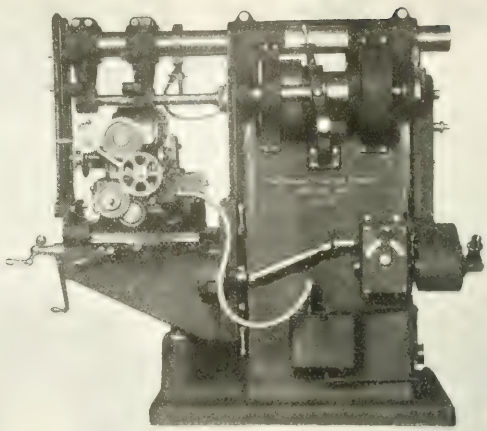


FIG. 2.—REVERSE SIDE OF MACHINE, SHOWING WORK IN POSITION, AND MEASURING DEVICE ON STOCK RACK.



PLAIN MILLING MACHINE WITHOUT POWER ELEVATION.



UNIVERSAL MILLING MACHINE WITH FULL AUTOMATIC FEEDS.

constant speed motor must be used any speed between 1500 and 1800 r.p.m. will be suitable.

The cutter grinder furnished with each machine is belt driven by tight and loose pulleys and needs no countershaft. The spindle is case hardened and ground to size, and runs in ring oiling bearings. Only one machine is furnished to each customer as one grinder will take care of a large number of cutting off machines.

A stock rack of any length desired and operated by means of a handwheel conveniently located beside the machine can be furnished as shown in Figs. 1 and 2. Where the machine is in continuous operation, this stock rack will be found to greatly increase production ing device, making it unnecessary for the operator to walk around to the rear of the machine for measuring. A single roller stand can also be furnished for use where only a few cuts are to be and is equipped with a patented measur-

PLAIN AND UNIVERSAL MILLING MACHINES

THE accompanying engravings illustrate two recent models of their No. 3 milling machine, which are now being produced by the Ford-Smith Machine Co., Hamilton, Ont. The illustrations show two types, viz., plain and universal, which, while of the same general proportions, are characterized by variations in certain dimensions and in weight according to their individual requirements.

The column, base plates and head are cast integral, the column being of heavy box type construction with internal shelves for tools, wrenches, etc. The spindle is a crucible steel forging, accurately machined, and provided with a 15/16-inch hole throughout its length. The spindle nose is threaded to receive a chuck or cutter head, and a cap is provided for protecting the threads when not in use. The spindle bearings are of ample size and substantial construction, and both are adjustable; the front bearing is of the tapered type, while that at the rear is of standard design. Adjustment of the rear bearing is secured by drawing up the tapered bush which in turn fits a tapered hole in the column. The spindle nose is bored No. 11 B. & S. taper, and is also slotted for positive drive.

The knee is a box type casting, heavily ribbed to resist the stresses from the saddle and table. Vertical adjustment is by means of telescoping screw fitted with ball thrust bearings.

The table of the plain miller has automatic feeds in both directions, and provision is made for the subsequent installation, if desired, of a vertical feed. The universal machine, however, has automatic feeds in the three directions, viz., cross, longitudinal, and vertical. Each feed is fitted with a positive knock-off which disengages the gear within safe limits of the extreme travel as well as at any desired point before.

All slides are oiled by means of felt wipers which provide efficient protection for the wearing parts against dust and cuttings.

Two arbor supports are supplied for supporting the arbor in the centre and the end, a front brace as shown supplying additional rigidity under severe operating conditions. A two-speed friction type countershaft is regularly supplied, and, when desired, an oil pump and piping can be fitted. Lubrication of the working parts has been carefully studied and a standard system evolved.

The principal dimensions of the machines are as follows: No. 3 plain miller. —Working surface of table, 53½ in. by 13½ in., three ¾ in. tee slots provided; traverse, longitudinal, 34 in., cross, 10 in., vertical, 20 in.; dia. of front bearing, 3⅜ in.; dia. overhanging arm, 4½ in.; centres, arm to arbor, 9⅝ in.; belt, 3½ in. wide; speeds, 18, from 12 to 260 rev. per min.; feeds, 12 from .006 in., to .092 in. per spindle rev.; floor space 95 in. by 115 in.; weight, 5,500 lbs. No. 3 universal miller.—Working surface of table, 52 in. by 12 in., three ⅝-in. tee slots provided; traverse, longitudinal, 30 in., cross, 10 in., vertical, 19 in., all automatic and reversible; weight, 5,750 lbs., other dimensions similar to plain type machine.

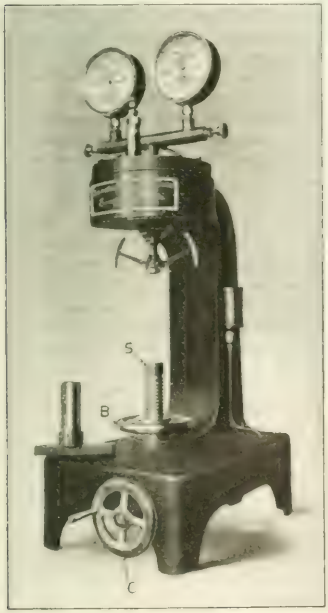
BRINELL HARDNESS TESTING MACHINE

A SIMPLE and accurate device for testing the hardness of metals is found in the improved model Brinell testing machine, which is a development of the common "ball and indentation" method for determining the degree of hardness of the metal undergoing test. The indentation or Brinell method, which is now very largely employed, consists in pressing a hardened steel sphere, which will not undergo deformation, into the surface of the metal to be tested and measuring the diameter or preferably the depth of the indentation. The degree of hardness may be computed by dividing the total load or force acting on the ball, by the area of indentation in the test sample, this area being determined by direct observation of the diameter of the circular depression by means of a convenient form of microscope.

While this method of computing the hardness numeral yields very valuable results, it is quite generally conceded that more accurate results are obtainable from direct measurements of the depth of the indentation in the test piece rather than the diameter of indentation. The Bureau of Standards and other laboratories have found that the plastic

loss of the metal of the specimen when pressure is applied in the ball, introduces uncertainties in the measurements of diameter, which do not arise when depth measuremen s are employed. This is a valuable point in favor of the latter method because the depth of indentation is directly proportional to the amount of pressure applied, while the diameter of indentation is not. Another advantage in using this machine with depth gauge, is that the extra operation of measuring the diameter of indentation is done away with and the personal equation is entirely eliminated.

The machine is a hydraulic press consisting of a heavy base in which the hydraulic power generation and transmission is provided; the upper neck formed with the base into a single piece casting, carrying the hydraulic piston, upon the end of which is mounted the standard hardened steel ball, 10 millimeters in diameter; and two pressure gauges. As shown in the figure, the depth gauge is mounted directly on the piston rod and reads the depth of the indentation accurately. The hydraulic pressure is produced by an easy turning spindle wheel, permitting a steady and finely regulated increase and decrease of pressure. The liquid employed is glycerine and the plunger of the press is constructed with a glycerine seal or trap so that no air can leak in behind the plunger during the compression.



BRINELL HARDNESS TESTING MACHINE.

The operation of the machine is simple and [illegible] does it involve any calculations. To make the test, the specimen to be tested is placed on the automatic levelling stage, mounted on the spindle, which permits irregularly shaped pieces to be tested, and any size up to 15 inches can be accommodated. The spindle is fed up to the stationary ball by turning the handwheel until the sample just touches the ball and the pointers of the depth gauge tend to register. The initial scale reading on the depth gauge is noted and the pressure applied slowly by turning the handwheel clockwise until the pressure gauge on the top of the machine indicates 3,000 kilograms, if hard metal is being tested, or 500 kilograms if the metal is soft. After the pressure has been acting for 1½ minutes, the reading of both pointers on the depth gauge may be taken, which completes the mechanical part of the work and the pressure may then be removed.

The mean of the two scale readings, using the figures noted on the scale, multiplied by 0.2 will give the depth of the indentation in millimetres. A convenient way to compute the depth of the indentation in millimetres is to add the two scale deflections and divide by 10. The hardness numeral is then found by referring to the table for depth measurements. A microscopic attachment can also be supplied for measuring the diameter of the indentation should that method be followed.

The weight of the machine complete is about 550 pounds.

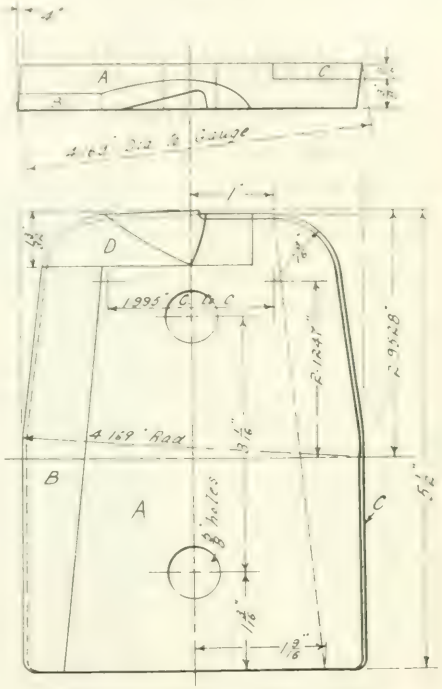
The machine, which is the product of the Scientific Materials Co., Pittsburgh, Pa., is carefully, substantially, and accurately constructed.

SPECIAL DESIGN BORING CUTTER

By J. H. R.

A DETAIL of machine shop practice that has always given more or less trouble has been the maintenance of flat boring cutters, this problem having of necessity received a great deal of attention during the past three years, owing to the wide use of this class of tool in the production of munitions. Various designs have been used by the different manufacturers, the general type being made of high speed steel of the desired size and shape. The high cost of this class of steel however, and the large quantity of cutters that were invariably required for maximum production, often resulted in considerable expense for the upkeep of cutters.

The cutter shown in the accompanying sketch was designed and constructed to minimize many of the disadvantages of the ordinary high speed steel cutter. It is claimed that these cutters will do more work than the solid type, as the soft steel center reduces the possibility of breakage, and also assists in absorbing the heat from the cutting edges of the tool. The center A is made of drop forged steel and the high speed steel pieces, B, C and D are welded on; the nose section D extending somewhat over the center, and shaped to allow for grinding a groove as shown, permitting of freer cutting and chip clearance. The use of this cutter effects economy in manufacture and tool maintenance together with increased accuracy in boring operations, as it is claimed that the center of the hole cannot be shifted during the cutting of the tool. These tools can easily be swedged out to size several times, often resulting in a saving of over 50 per cent. of cutter maintenance cost.



BORING BAR CUTTER OF SPECIAL DESIGN.

While these cutters were primarily designed for shell production, they may, with modifications, be adapted for many classes of boring work where flat cutters are used. This particular tool was designed and patented by C. L. Dixon of Montreal, P.Q., who is placing them on the market, both in the United States and Canada.

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VALUE OF A TRADESMAN'S ADVICE

WHAT is the difference between professional and trade advice? If a man follows a profession, such as that of the lawyer or doctor, he invariably seeks remuneration for services rendered, and it is quite proper that he should do so, as this is undoubtedly the source of his livelihood; but what is the status of the man who works at a trade during the day and is requested in a casual interview with one of these professional men to advise him concerning some small matter pertaining to tradesman knowledge? While a machinist was paying a visit to a physician some time ago in connection with a slight physical disability, the conversation turned to automobiles, with which the tradesman was quite familiar. As it turned out, the car owned by the doctor was not in the best of running condition. Before the patient left, the doctor knew considerably more about his motor than he did before the machinist called.

In the course of a few weeks the tradesman was confronted with a bill of several dollars for professional services rendered. What comparatively was the value of the "services rendered" to the doctor? If the machinist had put in a bill for his services, it is very unlikely that payment would have been made. The wage earner probably did not give a thought to receipt of payment for the advice he gave his physician; notwithstanding, the question still remains, what is the parallel between the two "services rendered?"

OUR DUTY TO THE RISING GENERATION OF MECHANICS

CONSERVATION is the watchword of the hour. Under the stress of present conditions which call for the co-operation of every individual in all walks of life to so conserve his own and the country's resources, that we may successfully meet the issues of the moment and those of the future, it is essential that due consideration be given to the perpetuation of such knowledge as each one of us may possess. A fact that must impress every fair-minded person during these revolutionary times is that a greater proportion of the world's work in the near future will be placed upon the shoulders of those young men who have not yet attained their majority. This will become increasingly apparent the longer the war lasts, as the need of more men, and still more men, will continue to make serious inroads into the rank and file now actively engaged in keeping the wheels of industry turning.

There is an old saying that "You cannot have old heads on young shoulders," and while there may be a few exceptions to this rule, it is invariably true, as most of us older ones must admit, that "Boys will be boys" and it is probably well that it is so. Nevertheless, when death and destruction are removing hundreds of thousands of men, who a few years ago were the keystones of the world's industry, it behoves us as waiting reserves, to hand down to the rising generation such tools as will enable it to "carry on" the heavy duties that are even now being placed upon its willing but untried shoulders.

Nowhere is this more evident than in the metal-working spheres of industrial activity, where revolutionary methods are being adopted to replace the efflux of men from all lines of manufacture. Under the stress of existing conditions, it has been found necessary to employ a greater percentage of female labor in trades formerly reserved for males exclusively. These conditions may continue for some time after the close of hostilities, but the post-war readjustments may eventually place the industries back on the pre-war footing, with the extreme likelihood that a large proportion of the future responsibilities will need to be borne by the youth of to-day, who now travels about carefree and unconcerned.

The education of our youths means more than the school training they are now receiving and the subsequent entrance to an engineering establishment to earn a living. The country's future depends very much upon the practical knowledge that the boy of to-day can acquire from the experience of his elders, before the latter pass from the sphere of action. Every facility should therefore be provided to allow him to become familiar with current practice, and his older fellow workmen should not discourage his apparent inquisitiveness in the endeavor to acquire information, but on the contrary should use every effort to instil into the younger mind as much of his own knowledge and experience as the boy is capable of absorbing.

"As the twig is bent, so is the tree inclined." The problem of to-day is to so shape and mould the life and character of the coming men that they may be persuaded to take a deeper and wider interest in the practical business affairs of life, and thus enable them to assume the obligations that circumstances have virtually thrust upon them. The executives of manufacturing plants should not consider the growing boy from the standpoint of earning capacity only, as the early training of every boy is more of a liability than an asset, but should look upon the lad as an essential factor in the ultimate efficiency of the business, and make provision for seeing that the same becomes an established fact. The boy of to-day is the man of to-morrow, and, realizing this, no effort should be spared in making the future man as efficient as possible.

A fault that is only too prevalent to-day is that many men are doing things without the knowledge of why they are done, and while this condition is often more profitable to the manufacturer, it does not tend to increase the productive qualities of the workmen, and may be the means of destroying any initiative they may possess. It does not follow that more time should be spent in instructing men in the fundamentals underlying their daily tasks, as many of the older men are past the age of accepting and appropriating such instructions, but where the boy is concerned it should be the duty of the employer and also his older associates to use every means to advance his theoretical and practical training and thus enable him to better qualify himself for those duties and obligations that the future will undoubtedly have in store.

INDUSTRIAL NOTABILITIES

ROBERT HARRIS PARKS, operating manager Canadian Car & Foundry Co., Ltd., Montreal, Que., was born at St. Charles, Mo., son of W. H. and Annie (Ruggles) Parks, and received his education at public schools, St. Charles.

He commenced his business career with the St. Charles Car Co., now part of the organization of the American Car & Foundry Co., remaining with this

ROBERT HARRIS PARKS

concern till 1896. He then became general manager with Merchants' Dispatch Transportation Co., Rochester, N.Y., 1896-1913; appointed general manager for the Davenport Company, Davenport, Iowa, 1913, which position he held till June 1, 1917, when he was appointed to present position with the Canadian Car & Foundry Co.

Mr. Parks married Ann Edith Silver, daughter of Robert D. Silver, of Denver, Colorado, June 1, 1898, and has one daughter.

His clubs are: Genesee Valley (Rochester, N.Y.); Rock Island Golf (Rock Island, Ill.); Outing (Davenport, Iowa); Kaministiquia (Fort William, Ont.).

In politics, Mr. Parks is Independent, and is Anglican in creed. His residence is Ritz-Carlton Hotel, Montreal, Que.

Photo courtesy British & Colonial Press

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	35 50
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	....	....
Victoria	60 00	....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	....
Tank plates, Pittsburgh	....
Structural shapes, Pittsburgh	....
Steel hoops, Pittsburgh	....
F.O.B. Toronto Warehouse	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 50
Structural shapes	5 00
Plates	7 00

FREIGHT RATES.

Pittsburgh to Following Points	Per 100 lbs C.L.	L.C.L.
Montreal	23.1	31 5
St. John, N.B.	35.1	45 5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22 1
Windsor	18.9	22.1
Winnipeg	64.9	85 1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	9 00	8 50
Antimony	18 00	18 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Standard Buttweld. Per 100 feet	Galvanized Standard Buttweld. Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Size.	Standard Lapweld.	
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	13 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	20 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turnings	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	7 00	7 00
Tea lead	6 00	5 75
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	35
Plate washers	List plus 20
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ⅞-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	57½
Wood screws, O. & R., brass	52½
Wood screws, flat, bronze	27½
Wood screws, O. & R. bronze	25

MILLED PRODUCTS.

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ¾ But. Hd. Cap Screws plus	net
Fin & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin and semi-fin nuts, over 1½ in., up to 2 in. plus	10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws, list plus	20
Collar screws, list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts, add 40,	10
Cold pressed nuts to 1½ in., add $4 50	
Cold pressed nuts over 1½ in., add $7 00	

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger	7 50	
Spikes, ¼ and 5-16 in.	8 00	

MISCELLANEOUS.

Solder, strictly	0 35
Solder, guaranteed	0 37½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100 lb. kegs, per cwt.	16 25
Glue English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single, bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. list plus	20
Emery Cloth list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto net

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52.	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring twist drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks list plus	30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING.

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable A add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$10 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B W G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 95
Premier, 10¾ oz.	13 85	11 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

¼ in.	$15 50
5/16 in.	11 50
⅜ in.	8 40
7/16 in.	7 40
½ in.	6 32
7/16 in.	6 32
½ in.	6 32
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS

	Per Cent
Globe	50
Vulcan	60
P H and Imperial	
Nicholson	40
Black Diamond	40
J Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	50
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$35 00	$
1¼ in.	40 00	
1½ in.	43 00	36 00
1¾ in.	45 00	38 00
2 in.	50 00	42 00
2¼ in.	53 00	48 00
2½ in.	55 00	52 00
3 in.	64 00	56 00
3¼ in.		58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS

Castor oil, per lb.	40
Boracite, per gal., bulk	16
Palaline	19
Machine oil, per gal.	26½
Black oil, per gal.	1
Cylinder oil, Castila	44
Cylinder oil, Acme	36½
Standard cutting	
per lb.	0 06
Lard oil, per gal.	2 00
Linen thread cutting antiseptic	55
Acme cutting oil antiseptic	36½
Imperial quenching	30½
Petroleum fuel oil	12½

BELTING.—NO. 1 OAK TANNED

Extra heavy, single and	30 5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft	$2 00
Lufkin Metallic, 603, 50 ft	2 00
Admiral Steel Tape, 50 ft	2 75
Admiral Steel Tape, 100 ft	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft	4 45
Reliable Jun. Steel Tape, 50 ft.	2 50

WASTE.

	White	Colored per lb.
XXX Extra		20
Peerless		20
Grand		19
Superior		19
X L C R		18
Atlas		18
X Empire		18
Ideal		17
X press		16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	30%

ANODES.

Nickel	50 to
Cuprite	1 55 to
Copper	44 to
Tin	45 to
Zinc	25 to

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars ½ to 2 in.	55 00	55 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	55 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 00
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd	0 55
Brass sheets, 8 in wide, 20 oz.	0 60
Brass tubing, seamless	0 55
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 00
Polishing wheels, bullneck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to
Rouge, powder	30 to

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs sq ft	$18 00	$18 00
Sheets, 3½ lbs. sq ft	18 00	18 00
Sheets, 4 to 6 lbs. sq ft	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ 15
Acid, hydrochloric	05
Acid, hydrofluoric	14½
Acid, nitric	10
Acid, sulphuric	05
Ammonia, aqua	08
Ammonium carbonate	15
Ammonium chloride	11
Ammonium hydrosulphuret	40
Ammonium sulphate	07
Arsenic, white	12
Copper, carbonate, anhy.	35
Copper, sulphate	17
Cobalt sulphate	70
Iron perchloride	20
Lead acetate	16
Nickel ammonium sulphate	12
Nickel carbonate	35
Nickel sulphate	15
Potassium carbonate	75
Potassium sulphide (substitute)	20
Silver chloride (per oz.)	65
Silver nitrate (per oz.)	55
Sodium bisulphite	10
Sodium carbonate crystals	05
Sodium cyanide, 127-130%	41
Sodium hydrate	04
Sodium hyposulphite, per 100 lbs.	5 00
Sodium phosphate	14
Tin chloride	60
Zinc chloride	60
Zinc sulphate	09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THERE have been no further developments in regard to the embargo although some announcement may be expected shortly as to what attitude the Priority Board will take concerning the export of iron and steel to Canada. It is to be hoped that there will be some modification of the embargo, but in view of the situation in the United States it is advisable not to expect too much. The demand for steel for war purposes is such that it is hardly likely that much material will be allowed to come in for any purpose other than for war contracts or contributory thereto. Fortunately the Canadian mills are well able to take care of the requirements for many commercial purposes, although some delay in deliveries may be expected. Prices of steel products continue firm with no indication of a decline. The pig-iron market continues firm at unchanged prices. There is a shortage of iron which affects the smaller foundries and those not having contracts. The non-ferrous metal markets are quiet and unsettled in sympathy with the situation in the States. The copper price regulation is causing some trouble, but a satisfactory adjustment is expected shortly. Lead, solder and antimony have declined, otherwise prices are unchanged. The machine shop supply business continues fairly active at firm prices with an upward tendency in some lines, particularly iron, steel and brass goods. The machine tool business is more active, as there have been a number of enquiries for shell plants from across the line. It is not unlikely that eventually some shell contracts will come to Canada from the States.

MONTREAL, Oct. 29, 1917.—Despite the embargo that exists on the shipment of materials from the States, business here continues to be of an encouraging character, although some anxiety is expressed as to early future conditions, which seem likely to become quite serious unless some relief is given to Canadian manufacturers, particularly in connection with steel and metals. A deputation of manufacturers and steel dealers is to wait upon Mr. O'Hara to-morrow and see what can be done to ensure relief.

Pig Iron

The attitude of the American Government in setting a fixed price on the sale of pig iron is not expected to bring any relief to the Canadian situation, as the requirements of the American Government and the market in the States will, it is thought, be sufficient to use the bulk of the metal turned out from the furnaces there. As domestic supply appears to be more or less left in the hands of the trade to adjust, it is believed that this market will suffer for the next few monthly, partly due to the low price set, and also to the inability of producers to supply other than the needs of the war department at the present time. The coke situation is a feature in the uncertainty of present conditions. The Canadian market is influenced by American developments, and furnaces here are not quoting on their output, as they are able to use all they produce with little surplus for the open market.

Steel

Developments of the past week contributed little improvement to the steel situation; no further price regulations have come into force, and results of previous adjustments have not materially

assisted in clearing the way for better conditions. The Priority Board at Washington are concentrating on their efforts to supply the American Government and that of the Allies with every requirement for war purposes before any material is allowed to leave the mills for domestic or non-essential enterprise. Summing up the situation, it would appear that the general consumer is as far in the dark as ever, as nothing has transpired to indicate that the producer is less reluctant to sell than when conditions were controlled by the open market.

A feature in the setting of prices to govern the prices of steel and other products is the possible effect that such action will have in connection with the output of the mills, as the attitude of the mills so far has not been conducive to relieving the general situation, few of the producers showing any great willingness to accept future domestic business at the price agreed on, even though this price is supposed to cover all sales of steel. The uncertainty of war requirements, however, may be the factor that influences the steel makers in not loading themselves up with orders they might be unable to fill. As there is a belief that the prices recently set are for the control of this quarter's business, the mills are showing no anxiety as to what the future has in store; again, it is expected that a further revision of prices may be effective at the New Year.

With additional price fixing pending, the market continues to be more or less unsettled. Buying on most products is confined to Government and other war demands. With the exception of ferro-alloys, which have become easier, the entire market is one of watchful waiting for further developments. The local situation has no feature to report, and dealers are in much the same position as the previous week, with all quotations holding firm. Apart from the necessary material that is required for the manufacture of war supplies, which can be obtained under license, it is practically impossible to secure steel for domestic or other purposes. A conference is to be held at Ottawa to-morrow by some of the leading steel dealers and manufacturers in connection with the situation that confronts Canada, due to the embargo that is virtually in effect regarding the shipment of steel to this country.

Metals

The general metal market is dull and inactive, being influenced by the uncertain conditions that still prevail in United States political circles. Local business is reflected in American developments. Copper is giving the consumer some anxiety. Tin is improving, while spelter is very quiet, and lead is reacting rapidly. Antimony and aluminum are quiet on poor demand.

Copper.—Ever since the fixing of prices to control the sale of copper, the consumer has been beset with greater difficulties than those experienced under the old method when the market was controlled by open quotations. Those users of copper who are working on Government contracts are amply supplied with metal, but the trade at large is much demoralized by present conditions. When it is definitely known just what the full requirements for war purposes will be, the open market may experience some relief. The New York market is nominal at the fixed price of 23½c. Local conditions are unchanged, with dealers quoting 31c and 30c per lb.

Tin.—The situation in this metal has developed a more encouraging tone under the belief that an understanding may soon be reached regarding the freer issuing of permits by the British Government. The urgent requirements of tin plate users is a factor in the situation that may induce the British authorities to reciprocate in relieving the conditions on this side. The market is not very active, but prices are slightly stronger, New York having advanced ½c during the week, the price quoted being 62c per lb. Dealers here report a fair demand, with prices firm at 63c per lb.

Spelter.—The absence of demand for American war requirements is more or less a puzzle to the trade, and what buying is reported is not heavy. Brass foundries are apparently showing little interest, and sales in this direction are light. A further decline of ¼c on the New York market has emphasized the dullness of this metal. The local situation is quiet, prices being weak at 10½c per lb.

Lead.—The rapid decline of lead has been the feature of the metal market for the past few weeks, and it is apparent that the extreme low has not yet been reached. The chief factor in the recent reaction has doubtless been that of supply over demand, together with the possible price that may be fixed by the Government. The week's decline of 1c in New York has placed the quotation at 5½c per lb., and demand is light even at this figure. Dealers here are asking 9c on a quiet market.

Antimony.—Very little business is offering and the situation is quiet. The New York quotation of 14½c shows a decline on the week of ¾c per lb. Dealers here report a weak market, with prices unchanged at 18c per lb.

Machine Tools and Supplies

Nothing of importance has developed to renew the waning interest in the machine tool industry; as a matter of fact, it is rumored that negotiations are under way for the disposal of munitions machinery in several plants that were among the largest producers of all types of shells. No definite action has, however, been taken as yet, owing to the uncertainty that still surrounds the shell making activity, and the evident reluctance of the Munitions Board to permit the dismemberment of those plants formerly engaged in this work. The Canadian demand for machinery during the past few weeks has been very quiet, the little that is passing being more of a general nature, much of the business going to plants that are interesting themselves in marine commodities. The activity that has followed the developments in the States has resulted in an abnormal demand for all classes of supplies, and has made it increasingly difficult to obtain delivery on imported products. Prices are not only well maintained, but show a stronger tendency.

Scrap

The situation in scrap metals and old materials is much the same, the trade still awaiting an announcement regarding the attitude of the American Government respecting fixed prices on this material. The New York market is generally easier, with lower prices ruling, but local dealers, while reporting a weaker tone, have so far maintained their quotations, which are on a par with last week.

TORONTO, Ont., Oct. 30. — Interest has been created in the machine tool trade by the possibility of shell contracts being placed in Canada by the United States Government. It may be some time before this business materializes or assumes important dimensions, but the possibility of such a development shows the advisability of trying to obtain war contracts of any kind from the States that may be offering. Canadian concerns have been for some time engaged upon marine work for the interests in the States, which has opened up a new field of activity and one which is highiy desirable at the present time. The fact that a local concern has decided to open up a branch factory across the line shows the importance that they attached to this field.

Steel

While some improvement in the steel situation may follow the visit of the Deputy Minister of Trade and Commerce to Washington it will not be wise to expect too much as a result of the negotiations with the Priority Board. The situation in regard to the allotment of steel in the States may be studied with advantage for developments across the line will in a measure be reflected in the market here. The Priority Board which has to do with the distribution of steel will have the task of keeping plants working on war orders supplied with steel and relegating the surplus to purely commercial purposes. This process of distribution is somewhat complicated, although very necessary. Firms not engaged upon war work are being handicapped by difficulty in obtaining steel and delay in deliveries incidental to the distribution process. Delivery of structural steel for private and public buildings has in many cases been stopped and construction held up. The automobile industry has already been seriously affected and manufacturing operations in many industries have been considerably curtailed. Conditions such as exist in the States are already discernible in Canada, for there has been for some time a shortage of steel for purely domestic purposes. With the above in view a material modification in the embargo seems unlikely and manufacturers not producing war equipment will

have difficulty in obtaining steel except such as is made in Canada. In other words strictly private enterprise will be held back for want of material. There has been no further development in the local steel market in regard to prices and the impression still prevails that prices will remain stationary for some time. It is understood that in the States very few sales have been made at the agreed prices so it is difficult to say what the market really is. How much more then must the uncertainty be in Canada in regard to prices, for it is generally understood that the price control does not affect this market. Purchasers of war material will, it appears, have to pay higher prices, at least for some time to come. Probably when the mills in the States have filled most of their orders, booked at high prices, there may be some reduction, but this eventuality is not yet assured as the outlook is so uncertain. At the present time there is no indication of lower prices, the only sign of weakness being in the lighter gauges of black sheets, which it is generally conceded were too high in price even when compared with other steel products.

Advices from United States steel centres indicate that further price-fixing announcements from Washington seem unlikely. The trade has been waiting for some weeks for additional prices to be announced on products not already agreed upon, such as sheets, tubular goods, wire products, and the delay has occasioned some surprise. On the assumption that prices having been determined on pig iron, billets and the most important steel products, it is advisable to let the market work itself into a position that would not require any additional formal control, the idea being to give the industry an opportunity to regulate its own prices. While this may tend to steady the market, the situation is very unsettled in the meantime and consumers are holding off awaiting developments.

Pig Iron

The pig iron market continues quiet and the situation generally unchanged. There appears to be no possibility of lower prices for some time as the furnaces are booked up for a considerable part of the first quarter of next year. Canadian furnaces are still operating on high priced coke, which alone would prevent any material decline in the market. There is also the embargo to be taken into consideration which has accentuated the shortage previously existing. The situation in the States appears to be improving. The iron trade is arranging a tentative price basis between buyer and seller and is not waiting for the official differentials defining the prices of the various grades and deliveries to be fixed. The furnaces have a lot of contracts to clear off before they can undertake much new business and it is a difficult matter just now to secure iron for prompt or nearby delivery as there is very little to be had. The coke situation is anything but satisfactory and promises to interfere with the production of pig iron.

Scrap

The market for old materials continues unsettled with both buyers and sellers awaiting developments in the situation. Prices are unchanged and entirely nominal.

Machine Tools

There is an air of expectancy in the machine tool trade in regard to future developments. On the one hand United States interests are investigating the market here for machine tools for munition plants, while there is also a strong possibility that war orders may be secured by Canadian concerns from the United States Government. Any extensive business of this nature, however, is hardly likely to materialize until the plants in the States are filled up with orders. The fact that Canadian plants and organizations are in a favorable position for quick production may help to bring business to this country. As far as actual domestic orders are concerned business in the trade is rather quiet but, as already inferred, interesting developments are anticipated.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Supplies

Trade has been fairly active in machine shop supplies and the market continues steady. Prices are firm on most lines with an upward tendency, although white lead has declined. White lead is now quoted at $16.20 per 100 lbs. in ton lots and $16.55 in less than ton lots. Linseed oil and turpentine are firm and unchanged.

Metals

The metal markets continue quiet and unsettled. Lead and antimony have declined but otherwise prices are unchanged. Considering the unsettled situation, business locally continues good, although the decline in munitions orders has affected those metals involved in the manufacture of shells. With the embargo on copper still in force, this metal is firm and scarce except in regard to supplies for munitions.

Copper.—The situation is still unsettled as far as it concerns smaller consumers and dealers as they are uncertain as to their position in regard to prices and they are having considerable difficulty in obtaining copper. The Copper Producers Committee which has been entrusted with the distribution of copper for the United States Government and the Allies has not yet completed its plans so the market is unsettled in the meantime. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—The market is firm and quiet in New York owing to the delay in shipments caused by the import regulation. As a result of this delay there is a shortage of spot tin and prices are consequently firm. Local quotations are unchanged at 63c per pound.

Spelter.—There is no improvement in the spelter market as far as demand is concerned, this metal being affected in sympathy with the quiet copper market. The trade is waiting for prices to be fixed, which is understood will likely be higher than the present market. Local price, 10½c per pound.

Lead.—Prices have ruled easier in sympathy with the New York market where the Trust price is now 5½c. The heavy fall in prices has stimulated business and the market is more active than for some time. Lead has declined ½c. locally and is now quoted at 8½c per pound.

Antimony.—The position of antimony shows no improvement and the market is weaker owing to lack of demand. Antimoney has declined 1c and is now quoted at 18c per lb.

Aluminum.—There is no change in the situation, the market remaining quiet and easy at 62c per pound.

Solders.—Owing to the continued weakness in the lead market, prices of solders have declined. Guaranteed is now quoted at 37½c and strictly at 35c per pound.

PITTSBURGH, PA., Oct. 27.—The chief topic of discussion in iron and steel trade circles the past few days is the rumor that has been circulating freely in Pittsburgh and New York that the Government has called a halt in the price fixing programme. No specific authority is cited for the rumor, and different members of the trade have different views about it. Some insist that there is no possibility of the Government doing anything but carry out its announced programme in full, and it may be recalled that early in the operation the statement was made, apparently upon the authority of the War Industries Board, that prices were to be fixed on "about 150 articles" of iron and steel. Others in the trade insist that there is something in the rumor, and point out that it would be a perfectly natural and reasonable procedure. A general price level has been clearly established. Prices have been set practically covering all pig iron; practically all unfinished steel such as billets, large [illegible] and wire rods; [illegible] and bar shapes and plates, which comprise about [illegible] the [illegible] have been fixed. As it was the intention to [illegible] all other items and in relation to these, the trade can be left to develop them in a satisfactory manner if it can. If it appears then the operation of price fixing can be resumed at any time. Frank A. Scott, chairman of the War Industries Board, is reported to have

resigned on account of ill health and to have gone to a sanatarium.

New Wire Prices

What the trade considers rather a curious thing is that the American Steel & Wire Co. has promulgated new prices, to be effective as from October 24. These prices represent advances of $2 a ton on plain wire, also galvanized; and $6 a ton on wire nails and barb wire, making nails $3.50. In some quarters the present action is interpreted as foreshadowing a Government fixing of prices at the $3.50 level, while in other quarters it is held that the advance may mean that the wire trade is expected to find its level. If the latter interpretation is correct it means that that War Industries Board will give the independents an opportunity to drop to $3.50 and if they do not it will resume price fixing.

Break in Sheets

A spectacular break has occurred in the sheet market. Last June and July it was difficult to buy at 8c, except in special circumstances, and considerable tonnages were sold at 9c and higher, in both black and blue annealed. It was not until about 30 days ago that sheets became easily obtainable at 8c. Ten days ago it was difficult if not impossible to buy at 7c. Last Monday some offerings of both blue annealed and black appeared at 6c, and later in the week the offerings became so common as to make the market quotable at 6c as maximum, if not as minimum also.

When the market declines with such rapidity to 6c one naturally doubts whether it will stop there, and it is interesting to recall that 30 days ago the sheet manufacturers were arguing that the Government should set a price of about 6.50c. Afterwards they yielded to 6c or a trifle less. There were predictions that the Government price would be 5c, but the sheet mills insisted such a price would be too low. Apparently the sheet market was a bubble and the bubble has been punctured. Many of the mills had no foundation in well filled order books but were simply selling at the fancy prices buyers chose to bid. Foreseeing Government price fixing the buyers have been able to hold off for a short time, and the mills could not bridge the interval.

The consumption of sheets in most directions has undoubtedly decreased, and it is possible the supply of sheet bars has increased. For some time past the production of sheets has been at considerably less than the sheet rolling capacity as the sheet bar supply was limited, the steel being put into other commodities.

Active Pig Iron

Government price regulation in pig iron is not preventing the market from being active. There is as much activity as there is any occasion for, there being frequent sales in nearly all districts of small lots for early deliveries, while neither buyers nor sellers are disposed to act upon late deliveries. It is nearly four weeks since the furnaces sent their recommendations to the War Industries Board, as to differentials between grades and districts, but Washington has made no announcement as to these details. Meanwhile the trade has adopted the practice of holding basic and foundry iron at $33 at furnace, irrespective of district. They are disposed to call No. 2 foundry 1.75 to 2.25 per cent. silicon, abandoning the 2.00 to 2.50 per cent. guarantee that became common three years ago when pig iron was hard to sell.

Steel Market Quiet

The finished steel market has continued decidedly quiet, but there is no good reason for assuming that the price fixing at Washington is the chief cause of its being quiet, except in the respect that it makes both buyers and sellers less disposed to act on the late deliveries. As to early deliveries there is little consuming demand, consumers as a rule being well covered. Generally speaking the consumption of steel in ordinary peace channels is decreasing as the country gets more and more to a war basis and is more disposed to economize.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

The Railroads

The railroads have not been buying to any extent for months, and there is relatively little steel still due them in the form of locomotives and cars, and otherwise. Consumption in various other directions is decreasing more or less. The maximum amount of steel the Government and its Allies could find means of consuming, for war purposes, cannot possibly represent anything like half the steel output. There is every reason to believe that unless there is heavy steel consumption on the part of the railroads steel will become relatively plentiful within a few months.

What will occur as to the railroads is one of the great questions. Steel prices are still very high and the railroads claim they cannot afford to buy. The 15 per cent. freight rate advance case, decided last July with some slight advances and tabled for further consideration unless conditions should change, has now been reopened by the Interstate Commerce Commission, the first hearings being set for November 5, but it is quite problematical whether the railroads will be given much of an advance. Then there is talk of the Government financing some railway purchases as a war measure since adequate transportation facilities are absolutely essential. Upon what is done with, or for, the railroads, may hinge the steel market a few months hence.

NEW YORK, OCT. 27.—Great activity continues throughout the machinery industries. The United States Government, shipbuilders and manufacturers of ordnance and ammunition holding Government contracts are the heaviest buyers. The shipbuilding programme of the Government, while somewhat delayed, is being carried out as has been previously outlined. In the past week the War Industries Board alloted contracts for 85,000 tons of steel plates and shapes for the building of destroyers and the shipyards holding these contracts placed additional orders for machine tools to be installed in the shops now under construction.

The Bethlehem Shipbuilding Co., through its Pacific subsidiary, the Union Iron Works, is rehabilitating the Risdon Iron Works at San Francisco. New shops are being built and equipped to build 16 destroyers for the Navy, a part of the contract for 40 destroyers awarded to the Union Works. Two destroyers will be built simultaneously on each of the eight ways of the Risdon Works. The tools for equipping the machine and fabricating shops originally purchased in the New York market, and a few additional orders for tools were placed this week. The New York Shipbuilding Corporation which is to build 20 destroyers at Camden, N.J. has put out a list of tools required for this work. The Newport News Drydock & Shipbuilding Co. and the William Cramp & Sons Ship & Engine Building Co., which will also build destroyers, also have placed additional orders for machine tools. The Federal Shipbuilding Co. has obtained from the Dominion Bridge Co. enough cranes to command the ship ways building in the Hackensack Meadows and is now in the market for 15 cranes to be installed in the shops at the same point. A list is also being prepared for about 150 tools to be installed in the machine shop.

The Submarine Boat Co., which has practically completed contracts for the fabrication of all of the steel needed for the construction of 50 boats for the Emergency Fleet Corporation, has just secured a priority order from Washington for the 85,000 tons of steel needed. The American International Corporation has also applied for priority certificates on 125,000 tons of steel, but the permits

are withheld until the fabricating contracts have been placed. Both of these interests are also buying fabricated steel shapes for buildings now under course of construction at the Government owned shipyards. The American Co. has just asked for bids on 7,000 tons of steel for tower foundations, while 10,000 tons of shapes are required for the shops and buildings. About 10,000 tons of shapes are required for the shops and buildings being constructed by the Lackawanna Bridge Co. and Worden & Allen Co. for the Submarine Boat Co. The latter company is purchasing equipment for the shops, and an order for cranes has just been placed.

The Merchant Shipbuilding Corporation and the Chester Shipbuilding Co., who will build 40 cargo boats for the Government, have placed contracts for the fabrication of 132,000 tons of steel with the American Bridge Co.; the latter company will also fabricate 33,000 tons of shapes and plates for the ten merchant boats to be built by the Federal Shipbuilding Co.

The War Industries Board is thus called upon to distribute orders for 500,000 tons of steel among the various structural mills, of which 170,000 tons have been allocated in the last five or six days. It will be recalled that the full Government programme for shipbuilding calls for 2,400,000 tons of steel, so that the tonnages now being distributed are less than one-fourth of the total amount needed. It is an interesting fact that the fabricated contracts placed by the Submarine Boat Co. call for completion by April 1, 1918, and some deliveries are to be made in November and December of this year. The first boat will be launched May 1, and all of the 50 boats will be launched by July 1.

Crane manufacturers are co-operating with the United States Government to build and deliver 300 locomotive cranes for shipbuilding, army cantonments and aviation camps, in the next three or four months.

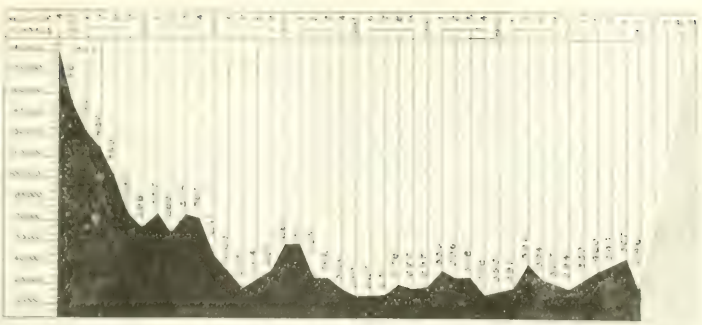

CHART SHOWING NEW VESSELS BUILT AND REGISTERED IN THE DOMINION OF CANADA DURING THE PERIOD ENDED DECEMBER 31 OF EACH YEAR FROM 1841 TO 1917 INCLUSIVE. THE SHADED PORTION TO THE RIGHT INDICATES THE ANTICIPATIONS FOR 1917-18-19.

RIGID ECONOMY IN METAL URGED

THE situation in regard to iron and steel supplies remains serious. Rigid economy in every scrap of metal is strongly urged as the result of a visit which F. C. T. O'Hara, Deputy Minister of Trade and Commerce, has paid to Washington. Some misunderstandings have been cleared up in respect of procedure in the handling both of export license applications and applications for priority assistance. Arrangements have been made, which it is greatly hoped will assist the Canadian manufacturer to secure articles he needs from the United States.

It is pointed out in Ottawa, however, that demand in the United States is abnormal. There is even a likelihood that a number of Canadian manufacturers will have to face sacrifice in the future for the reason it is not possible for the United States to supply many materials required for commercial purposes in Canada. Further, there is reason to believe that there will be a scarcity in materials required in Canada for the manufacture of articles which might properly be regarded as articles contributory to the war. It is felt that the situation can only be met by the strictest economy in the use of metals.

Arrangements have been reached with Washington whereby all articles now requiring piority shall first be covered by a priority application made by the United States shipper. Such priority application must be forwarded to the department of trade and commerce, Ottawa. The department of trade and commerce upon investigation as to the need and urgency of the article in Canada will recommend such priority as it can, based on the scheme laid down by Judge Lovett, chairman of the priorities committee.

It has been arranged to have an officer of the British embassy in Washington detailed to follow up with the export license bureau applications for export licenses which have been endorsed by the department of trade and commerce.

A committee of prominent iron and steel men is now investigating the iron and steel situation in Canada.

TO RECOVER SULPHUR FROM DIOXIDE FUMES

A NEW process for recovering sulphur from waste sulphur dioxide fumes is discussed in a report just issued by the United States Bureau of Mines, which says: "The results of the laboratory study of the wet Thiogen process demonstrate that the technical operation of the process can be carried out successfully for the recovery of sulphur from sulphur dioxide."

It is pointed out that the process will be of great value in the matter of conserving the supply of sulphur, especially as the supplies of pyrites imported from Europe have been curtailed since the beginning of the war. With the price of sulphur around $60 per ton, the added supply which can be produced from

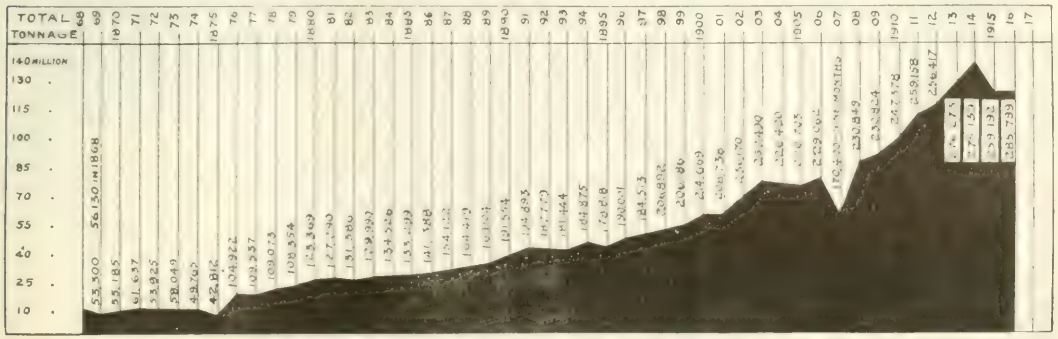

CHART SHOWING NUMBER AND TONNAGE OF SEA GOING VESSELS ALSO THOSE, EXCEPT FERRIES TRADING ON THE LAKES AND RIVERS BETWEEN CANADA AND THE UNITED STATES, INCLUDING ALSO VESSELS EMPLOYED IN THE COASTING TRADE WHICH ENTERED AND CLEARED FROM CANADIAN PORTS DURING THE FISCAL YEARS 1868 TO 1916 INCLUSIVE

waste smelting fumes for $13 per ton will do much, it is stated, to relieve the situation. It is believed that this process can be adapted to plants smelting from 2,500 to 3,000 tons per day.

The process is described in the "New York Engineering and Mining Journal" as follows: In carrying out the Thiogen process the gases are first cooled and cleared of all duct and fumes. They are passed through an absorption tower in which the sulphur dioxide is absorbed in water or mother liquor. To the solution of sulphur dioxide is added powdered barium sulphite, thiosulphite and sulphur; the precipitate is settled and the mother liquor is returned to the absorption tower. The settled precipitate is then filtered and dried. The elemental sulphur and one half the sulphur from the thiosulphite is distilled and the sulphur vapors condensed. The residue, consisting of barium sulphite and sulphate, is then reduced to sulphide, which is returned to the operation as a precipitate.

LIGNUM VITAE

THE lignum vitae of commerce, which is so extensively used in the stern bushings of shins for the bearings of the propeller shafts, ship pulleys, etc., is most suitable for this purnose owing to the highly desirable qualities that it possesses. This wood is obtained from the guaiacum tree and its growth is almost confined to the isles of the West Indies and the northern coast of North America. The wood is of a yellow color merging into green, and has an almost nulverulent fracture owing to the peculiar characteristics of the fibrous layers, which are of a combined diagonal and oblique arrangement. On a transverse section the annual growth is very slightly marked in concentric rings, and it is only with the aid of a magnifying glass that traces of the pith or sponge section is apparent; the medullary rays are equidistant, minute and very numerous. The outer wood, the sap-wood or albumum, is of a pale yellow hue and devoid of resin; the inner heart-wood or [illegible] men, which is by far the [illegible] portion, is of a dark greenish brown, containing about 26 per cent [illegible] and has a specific gravity of [illegible] fore sinks in water on which the sap-wood floats. The high specific gravity denotes hardness and density, and the fact that it is impossible to split it, makes it very durable and [illegible] where great pressure and [illegible] required. In addition to its extensive use in engineering practice, this wood is possessed of high medicinal qualities and in past times was, and even [illegible] largely used in the compilation of drugs and chemicals.

THE modern bicycle, fully equipped, weighs about 35 lbs., and will carry a load of six times its own weight with perfect safety under all ordinary conditions.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wligress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 21 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

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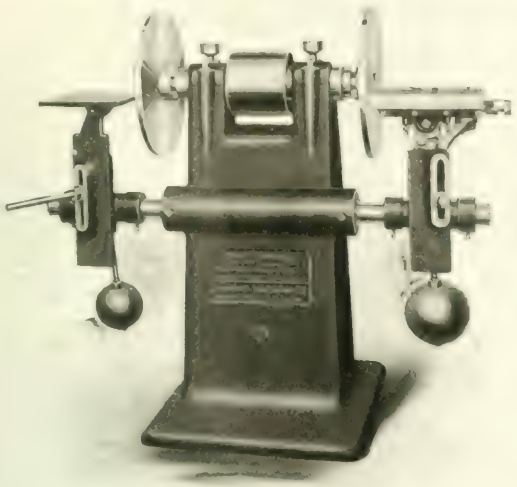

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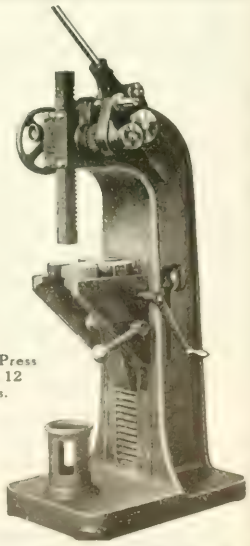

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Montreal, Que. — The Cedar Rapids Mfg., and Power Co., will build an addition to the power house at Cedars, Que.

Dartmouth, N.S. — The Liquid Air Society, Montreal, have purchased a site on which they will erect an acetylene plant.

Toronto, Ont.—Pugsley Dingman has a building permit for an addition to storage tanks at the soap factory on Cawthra Ave., to cost $1,200.

Toronto, Ont.— Oborn & Ellis, engineers and architects, will call for tenders shortly on drilling six-inch wells and supply of pumps, screens, etc.

Port Arthur, Ont.—Representations have been made to Ottawa asking that the Atikokan Iron Co's. plant be taken over and operated under government supervision.

Preston, Ont.—The Preston Woodworking Co., are building an addition, 40 x 100 feet, to their plant to accommodate the pattern shop and to make more room in the main building.

Sarnia, Ont.—The plans for the new foundry, to be built on the north side of Exmouth Street, Point Edward, have been completed by the engineers and the tenders and specification are now ready for the contractors.

Port Arthur, Ont.—J. J. Carrick, who some months ago procured the extensive pulp limits known as the Black Sturgeon, east of here, announced that arrangements have been completed for the establishment of a big pulp and paper mill at Port Arthur, the building of a pulp mill being one of the conditions of the limits.

Brantford, Ont.—The Dominion Steel Products Co. of this city has secured a large contract for the construction of heavy machinery for upwards of 100 merchant ships now being constructed in shipyards throughout the United States. The contract involves the extension of the company's plant in the Holmedale, and already extra land has been acquired for the purpose.

MUNICIPAL

St. Mary's, Ont.—The Town Council will purchase a motor driven pump.

Stratford, Ont.—The City Council will purchase seven-ton tandem gasoline road roller.

Kaslo, B.C.—Ratepayers passed a by-law to provide $1,500 to improve the electric light plant.

GENERAL

Toronto, Ont.—The Toronto Electric Supply Co. have a permit for building an addition to their premises on Hanna Avenue.

Chatham, N. B.—It is reported here that Montreal interests are negotiating for the purchase of the Dominion Pulp Co.'s mill and lands in this section.

Vancouver.—The Pacific White Lead Co. of Montreal will build a plant on Industrial Island, B.C., for the manufacture of lead, paint, etc., to cost $50,000.

Hastings, Ont.—The plant of the Hastings Tanning Co. was completely destroyed by a fire on Oct. 23. The loss is about $200,000. The Breithaupt Co. of Kitchener controls this concern.

Toronto.—The B. J. Johnston Soap Co. of George Street, will erect a reinforced concrete factory on Natalie street at a cost of $110,000. The new building will be 200 feet long by 82 feet wide and two storeys high.

Montreal.—Explosions and fire dedestroyed seven buildings of the Canadian Explosives Co., at Ile Perrot, near Vaudreuil, Que., on October 26. The explosions followed a fire which started in the shell-filling house of the assembling plant, and they continued at intervals throughout the day until about 6 o'clock. Among the buildings destroyed were the shell-filling house, the assembling house, the storehouse, and smaller structures, all having been constructed of flimsy materials, as is usual at such plants. The damage is estimated at $200,000.

INCORPORATIONS

The Warwick Machine Co. of Quebec has been incorporated with a capital of $100,000.

The Wallace Foundry Co. of North Vancouver has been incorporated with a capital of $75,000.

The Albert Lea Gas & Electric Co., of Moose Jaw, has been incorporated with a capital of $75.000.

The Warwick Machine Co. has been incorporated at Ottawa by J. E. Zuben, Samuel Fleury and J. A. Boulard to manufacture threshing machines, saws, waggons, sleighs, etc., at Quebec with a capital of $100,000.

Montreal Shipbuilders Ltd., have been incorporated at Ottawa with a capital of $300,000 to build and repair ships of all kinds at Montreal. The incorporators are Earl M. Macdougall, John B. Henderson and Leslie G. Bell, all of Montreal.

Heating Specialty Co., has been incorporated at Ottawa by James Parrish, Samuel Egan and William A. Ross of Toronto to manufacture stoves, furnaces, gas, electric and steam heaters, of all kinds at Toronto with a capital stock of $50.000.

Railway & Power Engineering Corporation has been incorporated at Ottawa by Theodore Malm, Gerard Ruel and William Bowler, all of Toronto, to carry on the business of manufacturing equipment, machinery and tools of all kinds at Toronto with a capital of $50,000.

Alloy Steel Works Ltd. has been incorporated at Toronto to take over the Moffatt-Irving Steel Works and to carry on business as steel founders at Toronto with a capital of $100,000. The provisional directors are Reginald H. Parmenter, Arthur J. Thomson and Samuel D. Fowler, all of Toronto.

ELECTRICAL

Thornton, Ont.—The Hydro by-law passed in the police village of Thornton on Oct. 22 by 46 for and 3 against.

Cobourg, Ont.—A movement is on foot to supply the village of Warkworth and farmers along the line in Percy Township with light and power, which will be brought in from Campbellford.

Owen Sound, Ont.—Plans are ready for the extension of the plant at Eugenia Falls by the Government, and a report by the department's engineers will be issued shortly suggesting the alterations and extensions required. It is understood that the Eugenia power plant is proving inadequate for all the power required.

RAILWAYS & BRIDGES

Montreal, Que.—An Act will be applied for at the Quebec Legislature to incorporate the Quebec and Atlantic Railway Company to build a road from Quebec City to Chicoutimi and to Cape St. Charles on the Labrador coast, the company to be capitalized at $1,000,000. The new railway is to connect with the N. T. R.

London, Ont.—The C.P.R. will, by the time that winter stops further work, have completed improvements east and west of London that involve an expenditure of about half a million dollars. Many thousand dollars are being spent at Galt in rebuilding the bridge and enlarging the yards. New abutments are being put under the bridge at Ayr. A new $35,000 station is being built at Windsor and about $20,000 is being spent in London on additions to the station and an addition to the blacksmith shop in East London.

CONTRACTS

Moncton, N.B.—The Humphries Glass Works have let contract for the erection of their new building to Ambrose Wheeler, of Moncton.

Walkerville, Ont. — The Dominion Stamping Co. have let some of the contracts for a new forge shop.

ECONOMY

That is the lesson we are slowly learning

Here is a machine — the Geometric Threading Machine — which has been economizing in screw thread production for a number of years. Busy automatic screw machines cannot profitably be slowed down to cut threads when there is a Geometric Threading Machine at hand. Especially since a Geometric Threading Machine costs one-tenth the price of automatics.

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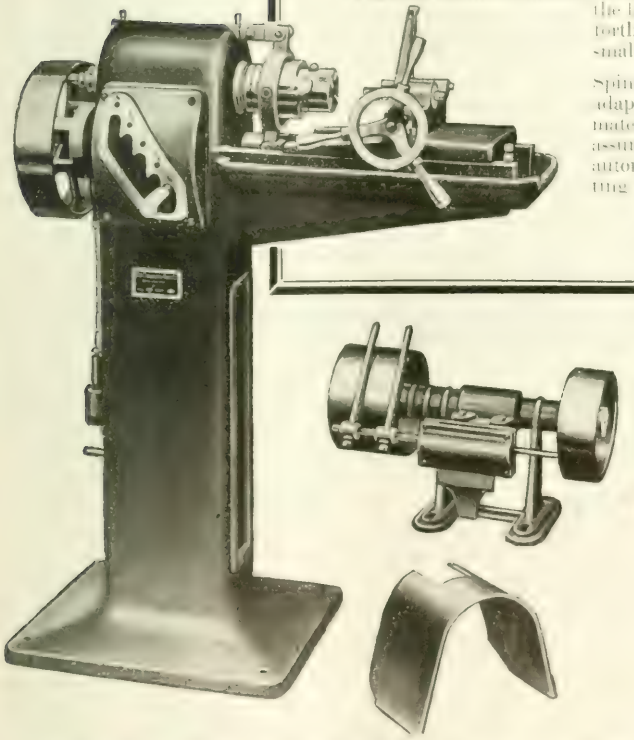
Made in three sizes—to cut 1/8 to 1/2 inch, 1/4 to 3/4 inch, and 3/4 to 1 1/2 inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.



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Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

MARINE

St. John, N.B.—There is a possibility of a wooden shipbuilding plant being established at Upper Gagetown near here.

Sarnia, Ont.—A contract has been let to the Gibb Dock Co. for the construction of a new ferry slip at this place for the Pere Marquette ferries. The work will start at once.

Sarnia, Ont.—Captain Wm. Sparling, of the Reid wrecking steamer Manistique, who was injured when a boom broke while the boat was working on the sunken steamer Graham, is reported to be in a serious condition at the Alpena Hospital. Captain Sparling, it was thought at first, was not badly injured, but later reports received here tell of his serious condition. He is very well known on the Great Lakes.

Yarmouth, N.S.—Two more shipbuilding companies have been organized in the Municipality of Clare, Digby County. One at Saulnierville is known as the Acadian Shipbuilding Co., with F. E. Comeau as president. The other, the Comeau Shipbuilding Co., is located at Comeauville, where they have just completed a mill which will be fitted with modern machinery. A large proportion of the stock of this company is controlled by the Clare Shipping Co. At Meteghan River, just south of the bridge, a New York concern has taken up property for shipbuilding purposes. They have erected two large mills on the premises, and they propose to commence building operations as soon as the necessary machinery is received.

TENDERS

Chapleau, Ont.—Tenders will be received by the town clerk until Thursday, Nov. 15, 1917, for turbine pump, 400 gallons capacity, operated by 40 h.p. motor. Specification, plan, etc., may be seen at the office of the town clerk at Chapleau, or at the office of Chipman & Power, Mail Building, Toronto.

PERSONAL

W. R. Payne, a well-known retired Canadian Government railway veteran, died at Moncton, N.B., on Sunday. He was born in Quebec 67 years ago.

F. C. T. O'Hara, Deputy-Minister of Trade and Commerce, Ottawa, has been in Washington conferring with the United States Priority Committee in regard to steel and other exports from the United States to Canada.

Frank G. Burch, who for several years has been connected with the sales staff of the Mussens Ltd., and later with the Canadian Allis-Chalmers Co. has become associated with the Canadian Ingersoll-Rand Co. as a salesman for the Montreal district.

Major Austin Taylor, of Montreal, has been appointed director of aeronautic supplies in British Columbia by the Imperial Munitions Board. Major Taylor will have charge of all matters pertaining to the development of the supply of the spruce required by the board for the construction of aeroplanes in Great Britain and Canada. Major Taylor was in charge of the Montreal Locomotive Works when they were engaged in the manufacture of munitions.

TRADE GOSSIP

The Ontario Molybdenum Co. has increased its capital stock to $60,000.

Victoria, B.C.—The Minister of Mines has received the information that an order for 6,000 tons of lead has been placed by the Imperial Munitions Board with the Consolidated Mining & Smelting Company of Trail, B.C.

Embargo Is Placed on Silver Spruce.—The exportation from Canada of silver spruce, (except under license) has been prohibited to all destinations abroad other than the United Kingdom, British possessions and protectorates.

The Davis Shipbuilding Co., Levis, Que., has obtained the contract for six more military barges. These vessels will be 130 feet long and will furnish work for 600 men throughout the winter. Two military barges are at present in course of construction at the Davie works.

On Prohibited List.—The British Government has prohibited the exportation of the following articles, effective October 18:—Coir fibre, fish hooks, goatskins and sheepskins, animal hair, lead, farming machinery, hosiery, needles, seal oil, wool and manufactures thereof.

Tungsten Market Quieter. — The tungsten market has not been quite so active of late but there is still a good demand at unchanged prices. Wolframite is quoted as to quality, at $23 to $25 and Scheelite at $26 per unit for the highest grade on the basis of 60 per cent. metal, or 30c per unit additional up to 5 per cent.

Record Government Contract.—The Bethlehem Steel Corporation has received orders from the United States Government for over 150 torpedo boats, to cost around $1,500,000 each. This would make the total value of the order approximately $225,000,000, which is the largest contract from the amount of money involved awarded by the Government since war was declared.

The Canuk Supply Co., Montreal, announce that J. T. Dohn, manager of their Toronto office, has been transferred to the Winnipeg office as manager there in charge of territory west of Fort William, Ont. W. J. Espey has been appointed manager of the Toronto branch, and E. L. Foley has been made eastern sales manager with headquarters at Ottawa.

Scythes & Co., Toronto, have extended the scope of their business by equipping a workshop at their premises in Church Street for making and repairing nautical instruments of all kinds. They have an up-to-date plant which will be a great convenience for vessel owners. The instruments manufactured will include among others, liquid and dry compasses, Kelvin pattern, sounding machines, etc.

North Vancouver Wants Drydock.—The council of the city of North Vancouver has taken a decided stand in favor of a Dominion government-constructed drydock on Burrard Inlet, and in a memorial prepared by Mayor Vance and which received the assent of the council, the Federal authorities are to be asked to undertake immediately the building of a drydock on the north shore as a Government undertaking.

The Electric Furnace Construction Co. of Philadelphia, Pa., announces that Frank Wharton Brooke, formerly metallurgist at Crowleys, Detroit, Mich. and at the Ludlam Steel Works, and G. W. Ketter, who has just finished the erecting and installation of ten to six ton furnaces at the British Forgings, Ltd., Toronto, Ont., and who has been erecting and superintending electric furnaces for years, have joined their staff at Philadelphia.

The Victoria Machinery Depot, Victoria, B.C. has the contract for the construction of twelve boilers of the Howden water-tube type for installation in the wooden hulls now being built on the Pacific Coast for the Imperial Munitions Board. It appears that these are the first contracts placed on Vancouver Island for boilers. Since there are 27 ships being built for the Imperial Munitions Board, which will require 54 boilers, it is possible further orders will be placed.

Coal Allotment for Canada.—Under a definite allotment of American coal for Canada, announced on Oct. 24, by the fuel administration, at Washington, about 2,000,000 tons of bituminous and 700,000 tons of anthracite will be permitted to move across the Canadian border during the next two months. The allotments, which will materially reduce the volume of exports, were arranged in consultation with the Canadian authorities, and after a review of statistics showing the Dominion's fuel consumption during the past year and the future needs of its industries and domestic consumers.

Permanent Harbor Headline is Made.—An Order-in-Council has been passed at Ottawa establishing a permanent harbor headline on the south shore of the Fraser river opposite New Westminster, beyond which no wharves may extend from Port Mann to the Government wing dam at Annieville bar. This harbor line was determined on resolution of the New Westminster Board of Harbor Commissioners, recommended by the chief engineers of the Public Works and Marine Departments, and is concurred in by the Minister of Public Works and Marine. Plans and a description are on file at the office of C. C. Worsfold, resident engineer of the Public Works Department, Post Office Building, New Westminster.

Close of Navigation Soon on Great Lakes.—It is expected that navigation on the Great Lakes will close about November 26. According to informa-

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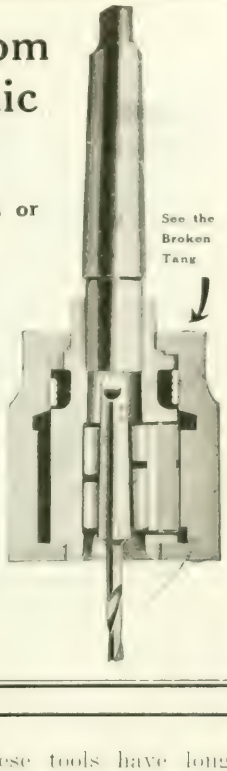
Holds tools with or without tangs



Have you heard of this latest Wahlstrom triumph and what it stands for? This new chuck permits the use of BROKEN TANG DRILLS—so don't throw away any more taper shank drills because the tangs are broken off—just install the *Wahlstrom* and save money.

Here are three other reasons why you should install the new chuck:

1. Produces work at greatest speed—because tool changes are made in less than two seconds and there is no chance of tool slippage in the *Wahlstrom*.

2. Produces work with most accuracy—because tools are automatically centered and the shanks are not torn and chewed, making true drilling impossible.

3. Produces work at less cost—because greater cutting speeds may be used—tools will last longer and workmen will produce more work.

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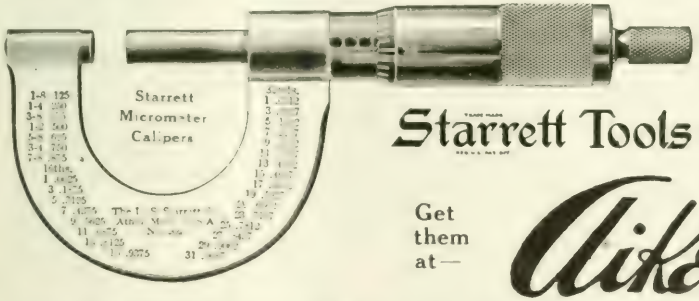

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These tools have long been recognized as the standard for accuracy, modern design, finish and fine workmanship.

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Every mechanic's time is at a premium now. You must supply them with tools of the "Starrett" standard of efficiency to get the best of work in the quickest of time. They are preferred by skilled mechanics everywhere.

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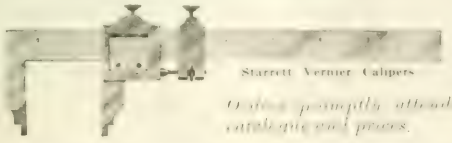
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If any advertisement interests you, tear it out now and place with letters to be answered.

tion received by the General Freight Department of the Canadian Northern Railway, the last steamers of the Great Lakes Transit Corporation, carrying package freight, will clear from Cleveland on Thursday, November 15, and from Buffalo, N.Y., on Monday, November 26. The boats will run to all Lake Superior ports, including Duluth and Superior. Shipments of freight made from eastern United States on and after November 1 and routed via the Great Lakes Transit Corporation will only be accepted subject to all-rail rates in event of the lake lines being unable to handle the traffic.

Telephone Without Wires.—Dr. Alexander Graham Bell, addressing the Canadian Club Friday night at St. Catharines, Ont., on "Apparent Impossibilities," said: "If the telephone has reached its extreme limits, what next? I cannot say what next, but I can tell you of something that happened in Washington about three weeks ago. The telephone has been applied to wireless, and a man in Arlington, just across the river from Washington, talked with a man on the Eiffel Tower in Paris by telephone without wires. But that is not all. A man in Honolulu heard the conversation. From Honolulu to the Eiffel Tower is 8,000 miles, one-third of the circumference of the globe. Does it not mean that we can talk from any part of the world to any other and without wire?"

Conserving British Blast-Furnace Dust.—Conservation of blast-furnace dust has been introduced in England, evidently with a view to recovering its potash content. The Minister of Munitions has issued an order providing that no person shall buy, sell, deal in or dispose of any blast-furnace dust, except under, and in accordance with the terms of a license issued on behalf of the Minister of Munitions by the Controller of Potash Production, and that no person shall treat any such dust so as to extract any component part thereof, except in accordance with the terms of the license. For the purpose of this order, blast-furnace dust shall mean dust deposited or otherwise derived from the gases of any furnace used for treating ores for the production of iron or any of its alloys.

New Lead Contract Closed by Smelters.—J. J. Warren, managing director of Consolidated Mining and Smelting Company, stated that the embargo on lead ores containing over four per cent. zinc was lifted, inasmuch as Sir Joseph Flavelle, head of the Munitions Board, had agreed to purchase the lead production of the company until March, 1918. The Minister of Munitions at Victoria, B.C., received the information that an order for 6,000 tons of lead had been placed by the Imperial Munitions Board with the Consolidated Mining and Smelting Company, of Trail. Furthermore and as a sequel to the representations made to the Federal Cabinet by Premier Brewster, the Dominion Government has agreed to remove the embargo prohibiting the exportation of lead and zinc into the United States.

Dominion Government Lifts Embargo on Lead.—As a sequel to the representations made to the Federal Cabinet by Premier Brewster, the Dominion Government has agreed to remove the embargo prohibiting the exportation of lead and zinc into the United States. Another matter has been referred to the Federal authorities, through the instrumentality of Hon. Mr. Sloan; the possibility of securing a remission of the duty on lead and zinc going from Canada into the United States, thereby establishing a uniform market for the disposal of those metals used in the manufacture of munitions. The smelter has agreed to receive, after November 1, all lead ores as formerly, to the extent of average shipments made last year from each mine, advancing the usual amount of money on receipt of the ore, and making final settlement when, and in such proportion as, the lead can be sold.

U. S. Embargo Extended.—A despatch from Washington states that another long addition to the list of articles which will be licensed for export only where they will contribute to successful prosecution of the war was issued recently by the War Trade Board. The new list includes: "Amorphous phosphorus, anti-friction metals, bichromate of potash, bismuth salts, boring machines and mills, brass, caustic potash, China weed oil, chrome steel, cronium, cobalt, copper, and alloys unless containing less than ten per cent., crucibles, industrial diamonds, drill presses (except sensitive), drilling machinery, ferro chrome, ferro vanadium, ferro tungsten, all articles containing flax manufactured in the United States, flannelette, grinders, graphite electrodes, animal hair, hydrofluoric acid, jute and producers, manganese, drilling machines except hand drillers, mercury, molybdenum, naxos emery, nickel and alloys, plumbago and products, planers, peas, salammoniac, sheetite, sodium phosphate, solder, tin and alloys, tungsten and alloys, vanadium, wool and all its products suitable for military purposes, and yellow phosphorus."

CATALOGUES

The Williams Bulletin and stock list of machine tools for October has been issued by the A. R. Williams Machinery Co., Toronto.

Ed. Bennis & Co., Little Hulton, Bolton, England, have issued an illustrated bulletin containing a description of the chain grates, sprinkling stokers and coal handling plant at the Corporation Electricity Works, Coventry, England.

The Goldie & McCulloch Co., Galt, Ont., have issued an attractive wall calendar for the twelve months ending October, 1918. The calendar is printed in colors, two schemes being utilized for alternate months. Each sheet has the days of the month in bold figures, and also views of the works and power plant installations.

Grinding and Polishing Machinery.—The Webster & Perks Tool Co., Springfield, Ohio, have issued a loose leaf folder containing a number of leaflets illustrating and describing an extensive line of ball bearing and plain bearing grinding and polishing machinery. A specification is included for each type of machine, giving the principal dimensions, etc.

Bennis Coking Stoker.—Catalogue issued by Edward Bennis & Co., Little Hulton, Bolton, England, dealing with the Bennis patent high temperature smokeless and gritless coking stoker. The catalogue contains a description covering the construction and operation of this stoker together with a number of illustrations showing installations with Lancashire boilers.

BOOK REVIEWS

The Japan Mercantile and Manufacturers Directory, 1917.—Published by The Far Eastern Advertising Agency, 7 Harima-machi, Kobe, Japan. This is the first directory that has been published covering the whole of commercial Japan and is a development of the Osaka and Kobe Directory published by the same concern. The rapid growth of business in Japan, particularly in the Osaka district, during recent years on account of the Great War, and shortage of many commodities in Europe, has caused the business men of Japan to realize the important position which their country has attained as a manufacturing nation. Merchants in foreign countries were anxious to know to whom they could apply for special lines of goods required, and also who were buyers. Many of these merchants were visiting Japan and it was felt that a commercial directory would be of the greatest assistance to both buyers and sellers. This situation created a field for a directory and accordingly this publication was compiled. The names and addresses of manufacturers and merchants which are given in both English and Japanese are arranged alphabetically. Each important city or commercial centre has its own section with a thumb tab index. One section contains a list of products and manufacturers. Among other features of interest in the directory are a list of diplomatic and consular representatives, tables of Japanese weights and measures, postal and telegraphic information and a number of views of the principal cities in Japan. The advertising pages also contain considerable interesting matter as the advertisers are the principal firms in the country. This is unquestionably the most complete publication of its kind dealing with commercial Japan and will be very useful to Canadian manufacturers or merchants who desire to extend their business activities in Japan. The directory contains 800 pages, 11½ x 5¼ ins., and is bound in attractive red cloth covers with general index and advertising index.

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Tools of proved accuracy and durability.

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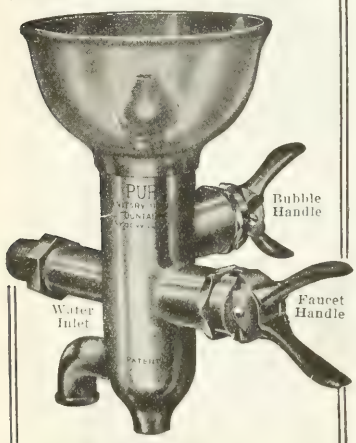
Saves Dollars
Why let that old-fashioned faucet go on year after year wasting water—MONEY? Why more drinking cups and glasses, only to become unsanitary—lost, broken or carried away? Puro Sanitary Drinking Fountain stops all this needless waste. Puro saves you 35% on the water bill alone. Puro saves you all that money you spend for cups. YET Puro is always ready with a clear, cool drink with dollars in the bank


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You don't have to wait years to get back the small investment you have tied up in Puro equipment—
You start cashing in at once not only on your water bill saving, but on the increased efficiency of your workers as well.
Men like PURO it's clean. No danger of deadly germs lurking in its sparkling bubble. Write us—tell how many men, how many departments, and we'll tell you how much the cost will be to
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STEEL PRODUCTION FOR WAR PURPOSES

THE steel industry in the United States in the last nine months has operated at an average rate of about 3,600,000 tons of steel ingots per month, which would give an annual output of 43,200,000 tons of ingots, permitting the production of approximately 32,400,000 tons of rolled products. The United States Government is calling upon the steel mills now for about 5,400,000 tons of various products for war purposes, and this tonnage, doubtless, will be increased by a million tons in the near future. Of the total annual output of the rolling mills, therefore, the United States Government is taking 16.6 per cent., and this probably will be increased to 20 per cent. within a few months. If it be assumed that the Government will pay an average price of 3 cents per pound for this material, the total expenditure will be $416,880,000 for this 5,400,000 gross tons, or $500,256,000 for the 6,480,000 tons to be bought.

The Allied Governments to-day are taking 2,600,000 tons of steel from the United States mills, and this will be increased to 3,600,000 tons in the near future, equivalent to about 11 per cent. of mill output. Together, the United States and Allied Governments, therefore, will take about 30 per cent. of the total rollings of the steel mills, and there is a possibility that 40 per cent. may be needed when all of the indirect demands for war munitions have been satisfied.

Of the 20,000,000 tons of unfilled orders on the books of the steel companies, it is understood that only a few million tons represent war orders, so that in the aggregate mill capacity is pre-empted for almost a year. This does not mean that all products are fully sold for this period. In some lines mill capacity is sold for six to eight months, while capacity to produce other products has been taken up for from twelve to fourteen months.

1917 CANADIAN COAL OUTPUT

THE mines branch of the Department of Mines, Ottawa, has received from the principal coal mine operators returns of their production during the first three months of 1917 on the basis of which the following estimates have been made of total production during this period. According to these estimates the total production of coal during the first quarter of 1917 was 3,590,991 short tons, comprising 1,233,934 tons in January; 1,143,956 tons in February, and 1,213,101 tons in March.

The record would appear to show that the average rate of production in Nova Scotia and British Columbia was less than the average rate of production during 1916, but greater in the Provinces of New Brunswick, Saskatchewan and Alberta.

The exports of coal during the three months were 501,570 tons, as against exports of 737,744 tons during the corresponding period of 1916.

The imports of coal during the three months were 3,921,824 tons, as against imports of 4,002,892 tons during the corresponding period of 1916.

The production of oven coke during the first three months of 1917 was 308,690 tons—the imports during the same period being 207,139 tons, and the exports 5,606. tons.

PROJECTED IRON AND STEEL INDUSTRY IN PORTUGAL

THE "Diario do Governo" (Lisbon) of 14th April publishes a law authorizing the Portuguese Government to grant, by means of a public call for tenders to a Portuguese firm or enterprise, a fifteen years' concession for the establishment and exclusive right of working of an iron and steel industry by the most modern processes. The concessionnaries must install at their own cost a modern iron and steel works, comprising blast-furnaces, steel furnaces, rolling mills, presses, shearing machines, wire-drawing plant, and any other necessary accessories for an initial annual production of at least 100,000 metric tons of cast iron and for the manufacture of iron and steel bars, plates, sheets, rails, etc. The establishment must be in working order within a period of five years from the date of the granting of the concession. The Government, on its part, will grant land for the erection of the works, exemption from industrial and other taxes, etc. The concessionnaire will be able to import free of customs duty all plant and materials which cannot be satisfactorily acquired in Portugal during the first five years of the the concession. The Government will also authorize the construction of railway lines up to 15 kiloms. (about 9½ miles) to connect the new works with the State railway lines in the vicinity.

ROMANCE OF "WIRELESS"

WIRELESS telegraphy is playing an extraordinarily important part in the war. Its uses were foreseen, up to a point, before hostilities began, but its developments have been beyond the wildest pre-war imagination. Every moment it is figuring in the great world drama, and almost day by day we are receiving illustrations of its principal part in what may be called the subdramas of the conflict raging over so large a portion of old Earth's surface.

It is difficult to say which is the more wonderful and intensely interesting—the manner in which wireless co-ordinates an army's many activities in the field or that in which it narrows the seas. Wireless at sea has had its more widely known romances, perhaps. It has an important share in the conduct of the submarine campaign—and a greater one in meeting it. Our patrol boats in their thousands, our destrovers and submarine hunters in general, have ranged the water unceasingly, always on the alert for their prey and for news of where submarines may be operating. In the majority of cases the news comes by wireless. A merchant ship, say, is attacked by one of the pirates. Out go

her aerial signals, to be picked up by vessels near and far, warning passenger or cargo boats of the place where there is danger and inviting the fighting craft to the rescue.

Of such episodes scores stand out as spies. One of the most thrilling was the adventure of the Anglo-Californian, a vessel which was homeward bound from Montreal with a cargo of horses, and was chased and shelled by a submarine. At once the wireless operator, J. F. Rea, sent out the news into the air. Many miles away it was picked up by a warship. Then ensued a long-sustained and poignant wireless dialogue. The warship was coming along at top speed, and the Anglo-Californian's wireless man was telling of the progress of the chase. Fight it could not be, as the merchant vessel was unarmed. Shell after shell tore into the ship, but the gallant captain proceeded on his way, meeting the submarine's tactics with skilful navigation which kept the pirate astern, the while he followed as well as possible the wireless instructions, as to his course, received from the warship. An hour passed; two; three. The Anglo-Californian, told to hold on as long as possible, was grimly enduring a terrible bombardment in which the captain, eight hands, and 20 horses were killed. "For God's sake, hurry up. Firing like blazes," was one of the messages radiated by the wireless man to the warship. Mr. Rea was lying on the floor of his room with broken glass all around him, and "the place stinking with gunpowder," as he told the warship by wireless.

The submarine, in the event, was foiled. After four hours of effort she had to dive, apprehending trouble from the warship, and the survivors on the Anglo-Californian proceeded on their way in due course, later to receive a high tribute from the Board of Admiralty. Mr. Rea was presented by the Board with a gold watch in recognition of his conduct (brilliantly described by Alfred Noyes in those wonderful articles of his) which saved the situation.

Many columns could be filled with fine stories of the share of wireless in sea warfare. Our fleets have a conspectus of the North Sea by the aid of wireless, the messages coming from the patrol ships on the water and the aircraft which traverse the sky in all directions above. German submarines use wireless, and act according to instructions received, from Heligoland or elsewhere, through their aerials. A British aviator may detect a submarine below the surface and wireless to a handy destroyer, which may therefore be able to trail the pirate to his doom. During the battle of Jutland, Jellicoe and Beatty owed much to wireless; and there are stories of how Von Spee intercepted and misconstrued radiated information and inquiries emanating from Admiral Sturdee. In short, whatever is happening on the sea nowadays becomes known through wireless.

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Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company

303 Congress St., BOSTON, MASS. U. S. A.

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PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS

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Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Write for Booklet.

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FOR SALE

SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c18m

BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

FOR IMMEDIATE SALE—150 No. 1 AND 10 No. 7C Racine hack saw machines; in excellent condition. The Peck Rolling Mills, Limited, Montreal, Quebec. c19m

2 NORTON GRINDERS — 10" x 36"—IN FINE condition; complete with stock of Norton wheels. Price $1,400 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

3 JONES & LAMSON TURRET LATHES, WITH Collet chucks; 3" x 36"; geared head machines in fine condition. Price $1,000 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENCIES WANTED—FRENCH ENGINEER having large established clientele, desires direct agency for France of labor-saving machinery of all kinds for wood and iron working, as well as factory equipment. Headquarters in hearts of Paris, near the Opera. Write E. A. B., Room 444, 14 Phillips Sqr., Montreal.

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

SHOP SUPERINTENDENT—WANTED, MAN competent to take entire charge of machine shop solely engaged in manufacture of small tools. Must be thoroughly competent and have had some years' experience. Shop while small at present offers excellent opening for advancement. Apply, stating experience, salary, etc., to Box 339, Canadian Machinery. c17m

WANTED — FOREMAN BLACKSMITH FOR Montreal shop on general work. Six forges and 1,500-lb. steam hammer. Must be a hustler. Apply, in confidence, stating experience and wages expected, to Box 335, Canadian Machinery. c15m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

WANTED—MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED

Vertical Boring Mills, 50 to 60" swing.

Horizontal Boring Mills, 3 to 6" boring bar.

Hobbing Machine, for cutting worm wheels 42" diameter.

Spur Gear Cutter, 60", B. & S.

All for Government work. Machines must be in first-class condition. Wire prices and where machines can be inspected.

RUSSELL MOTOR CAR COMPANY, LIMITED

Toronto - Canada

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GENERAL SUPERINTENDENT DESIRES position with reliable firm. Possess years of practical machine shop experience as well as production methods, including shell work. Box 338, Canadian Machinery. c18m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Immediate Shipment

1—AUTO MULTIPLE PUNCH made by D. Bergue & Company, of Manchester, England, 20" long by 6' 6" wide, fitted with eighteen punches to punch ⅝" diameter holes through ⅝" plate, including eighteen ⅝" punches and one set of twenty-seven ⅝" punches. This machine is practically new and each punch is adjustable for centers and any one can be thrown out of action at any time.

1—10' NILES BORING MILL takes 43" under the crossrail, width of rail 19", two swivel heads, tool bar 6" round by 24" travel, power friction feeds drive six step cone for 4" belt, in absolutely first-class condition.

1—42" NILES BEMENT POND BORING MILL, latest type, two swivel heads, single pulley drive, all geared feeds, nearly new. Four-jaw combination chuck in table

1—6' BERTRAM HEAVY DUTY RADIAL DRILL, single pulley drive, four speeds in speed box, tapping attachment in spindle, plain box, table excellent condition.

1—6' LONDON DRESES PATTERN HEAVY DUTY RADIAL DRILL, round column type, speed-box drive arranged for motor drive, in first-class working order

1—BERTRAM HORIZONTAL BORING MACHINE, cone type headstock, four step cone for 4" belt, spindle 4", diameter 36", feed slotted, adjustable table 48" wide 36" long.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine with 12" three-jawed chuck
1—Lathe 28" swing 8' bed.
1—Air Chuck Double End Rough Turning Lathe
1—Single End Rough Turning Lathe
1—Single End Lathe for taper turning
1—Single End Base Boring Machine
1—Double End Tool Grinder
1—Jenckes Grinder
2—Boring Machines C.M.C. with heads
2—C.M.C. Lathes equipped for boring and tapping
1—22" Barn Turret Lathe
1—Jenckes Copper Band Lathe
1—Gisholt Lathe with 12" Universal Chuck
1—14" Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe 34" swing 8' bed.
2—Pratt Swing Shell Grinders complete
1—42" Bertram Lathe equipped for shell grinding
1—Drill Press, fitted for screwing in sockets
1—42" Swing Arms Turret Lathe for screwing sockets, fitted with air chuck.
1—Double End Forming Machine with 5 h.p. motor.
1—Jenckes Automatic Copper Band Press
1—35 H.P. Canadian General Electric Motor, complete with starting box.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—40 H.P. Canadian General Electric Motor, complete with starting box.
1—Westinghouse 50 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—6 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

The Chas. A. Strelinger Co.

43-51 East Larned St., Detroit, Mich.

MACHINE TOOLS IN STOCK FOR IMMEDIATE DELIVERY

DRILLING MACHINES

GRINDERS

LATHES

MISCELLANEOUS

PETRIE'S LIST of New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

ENGINE LATHES

15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' Porter, B.G., comp. rest.
18" x 8' C.M.C., D.B.G., comp. rest.
20" x 8' Fifield, B.G., plain rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.

DRILLS

20" Barnes, 3-spindle, lever feed.
Kerkhoff, back geared, power feed.
40" Bickford, back geared.
No. 3 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 2 Landis, universal
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
24 Barnes, wet tool.
Yankee, twist drill.

IRON PLANERS

20" x 20" x 5' Bertram
24" x 24" x 6½' Bertram
x 24" x 12 Lodge & Davis
30" x 30" x 10 Pond, two heads
40" x 40" x 12 New Haven power feed

MILLING MACHINES

Bertram, plain.
Brown & Sharpe power feed plain
Cincinnati, vertical
Cincinnati, bevel hand feed
No. 2 Ford Smith, plain
No. 1 Lux, universal

SHAPERS

16" Pedrick, back geared.
16" Canada Mach. Corp., back geared.
Cincinnati, back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

12" Hall Pipe Machine.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
150-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

If any of these items are of interest to you, tear it out now and place with letters to be answered.

RIVERSIDE Machinery List

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

2—18 x 8 Springfield Q.C.G. Engine Lathes.
1—18 x 8 Springfield Standard Engine Lathe.
1—16 x 8 Springfield Q.C.G. Engine Lathe.
2—16 x 6 Springfield Q.C.G. Engine Lathes.
1—14 x 6 Springfield Geared Head Engine Lathe.
3—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
1—20 x 20 x 10' Wilson Two-head Planer
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
2—20" Champion Plain Drill Presses
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—32 x 10 Reed Standard Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
2—13 x 8 Barnes Engine Lathes.
1—13 x 5 Barnes Engine Lathe.
1—10 x 4 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—4" Foster F.G.H. Hand Screw Machines.
1—5" Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes with air chucks.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—6' Mueller Plain Radial Drill, old type.
1—28" Niles, Bement, Pond B.G., P.F. Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—36-spindle Natco Drill.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 20 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—300-lb. B. & S. Roll Board Hammer.
1—400-lb. P. & W. Roll Board Hammer.
1—150 lb. Bradley Steam Hammer.
1—25-lb. Fairbanks Belt Hammer.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT

17-29 St. Aubin Avenue

DETROIT, MICH.

Good Used Equipment

TRAVELING CRANES.

20-ton Browning Trolley, 5 ton aux., 56½' ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C., 3 motor.
10-ton P. & H., 48' span, 110 V.D.C., 3 motor.
20-ton Reading, 29' 6" span, hand.
10-ton Maris, 55' 0" span, hand.

PUNCHES AND SHEARS.

Single, 48" tht., cap. 3 x 1¼", Providence.
Single, 12" tht., cap. 1 x 1", L. & A. (2).
Single, 28" tht., cap. ⅞ x ⅞, belted, Cleveland.
Single, 6" tht., cap. ⅞ x ⅞, Cleveland.
Single, 15" tht., cap. ⅜ x ½" (hand), new Doty.
Double, 12" blades, Bar Shear, cap. 2" sq., Cruc.
Double Angle Shear, cap. 6 x 6 x ¾", Cleveland, belted.
Univ. Plate Shear, 18' blades, cap. ¾", Cleveland, belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis, belted.
Lennox Rotary Splitting, 30" tht., cap. ½", belted.
Lennox Rotary Bevel, 7" tht., cap. ½", belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shears, No. 0 H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Shear, Stoll, 53" cap., 14 gauge (new).
Squaring Machine, United, 108" cap. ¼".

MISCELLANEOUS.

Bolt Cutter, 2" Acme, Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 200-lb. Bradley, belted.
Hammer, 300-lb. Johnson & Jennings, belt driven.
Hammer, 80-lb. Bradley Cushion Helve, belted.
Hammer, 40-lb. Bradley, belted (rebuilt).
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 v.

GOOD CONDITION.
PROMPT SHIPMENT.

McCoy-Brandt Machinery Co

216-18 Penn Ave.

PITTSBURGH, PA.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BLDG.

PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

2—No. 3 Hendey Universal Milling Machines.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.

USED MACHINERY

ENGINE LATHES.

8—30" x 10' American, Gear Head, A-1.
1—20" x 10' Bullard.
3—24" x 14' American.

TURRET LATHES.

36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2½" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt Chucking Lathes, 6½" hole in spindle, square turret.
14" x 6' Lodge & Shipley Turret, back geared.
5—24" Gisholt, 2-step cone, 6¼ H.S.

BORING MILLS.

6—66" swing Bement-Miles Tire Turning Mills, two swivel heads, 15½" under rail
1—37" Baush Boring Mill, 2 heads; good as new.
1—Cylinder Boring Mill, capacity of 24" diam. to 96" diam., 10' long. Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

SCREW CUTTING MACHINES.

2—2¾" Cleveland Automatic, Model A.
1—1¼" Cleveland Automatic, Model A.
1—2" Cleveland Automatic.
1—No. 55 National Acme, 4 spindle; good as new.
1—No. 54 National Acme, 4 spindle; good as new.

GRINDERS.

1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
5—Fisher Profile Grinders for Cutters.
5—No. 6 Std. Universal Tool and Cutter Grinders.

DRILL PRESSES.

1—4' Prentice Radial Drill, tapping attachment.
1—2' 6" Fosdick Radial Drill, tapping attachment.
1—5' 6" Full Universal American Radial Drill, tapping attachment.
2—D1 Colburn Heavy Duty Drills, latest pattern.
2—D3 Colburn Heavy Duty Drills, tapping attachment, latest pattern.

FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼" x 14" x 17'—7" in dia.

Merchants Rubber Factory

KITCHENER, ONTARIO

c20m

USED MACHINERY

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22" Sibley, S.H., B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
2½ Gang Plain Radial.
3½ Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
4 No. 310 Baker Heavy Duty.
3-spindle Pedestal.
4-spindle Rockford.
4-spindle Avey, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3—26" B. & S., spur gears.
No. 4—48" B. & S., spur gears.
No. 13 B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur gears.
36" Walcott, spur gears.
24" Gleason Gear Planer.

GRINDERS.

No. 1 B. & S. Universal.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.

LATHES.

14" x 6' Rockford, C.R.
16" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
18" x 10' Fitchburg, C.R.
20" x 14' Bluisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
48" x 16' Fifield.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Cincinnati, two heads.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
48" x 48" x 10' Woodward and Powell, two heads.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, auto. chuck, power feed to turret slide and power feed to cross slide.
No. 5 Foster, all geared head, auto. chuck and wire feed, power feed to turret slide.
1¾" Gridley, 1-spindle Automatic.
2¼" Cleveland Automatic.
3¼" Gridley 1-spindle Automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2" x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, straight sided, geared.
Blake & Johnson Embossing.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 18" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾," 24" throat; new.

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
No. 3 B. & S. Universal Miller, with vertical and rack cutting attachments.
6" x 48" P. & W. Thread Miller.
1-spindle Warner & Swasey Valve Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
No. 3 Burr Cold Saw.

STOCKER-RUMELY-WACHS COMPANY
117-121 NO. JEFFERSON STREET CHICAGO, ILLINOIS

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

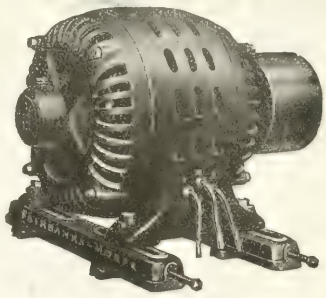
A. B. JARDINE & COMPANY, Ltd.
HESPELER, ONT.

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



Fairbanks-Morse Induction Motors

FOR

Immediate Delivery

We have in stock at Montreal and Toronto the following motors:

3 Phase		60 cycle
1 - ½	H.P.	110 volts
2 - 1	"	550 "
2— 1	"	220 "
1— 1	"	110 "
6 2	"	550 "
1 - 2	"	220 "
6 3	"	550 "
2 - 3	"	220 "
6 5	"	550 "
4 5	"	220 "
7 - 7½	"	550 "
1 - 7½	"	220 "
10	"	550 "
2 10	"	220 "
7—15	"	550 "
1 15	"	220 "
1—20	"	550 "
5—25	"	550 "
1 25	"	220 "
2—30	"	550 "
2—40	"	550 "
1—50	"	550 "
2—75	"	550 "

3 Phase		25 cycle
2— 1	H.P.	220 volts
1 2	"	550 "
3 — 3	"	550 "
1— 7½	"	550 "
1 10	"	550 "
3 15	"	550 "
3 20	"	550 "
2—30	"	550 "
2—35	"	550 "
1—75	"	550 "

The Canadian Fairbanks-Morse Co., Limited

St. John Quebec Montreal Ottawa Toronto
Hamilton Windsor Winnipeg Saskatoon
Calgary Vancouver Victoria

CFM

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

New York's Greatest Stock

Our Own Machines Rebuilt and Guaranteed

(Partial List)

Detrick and Harvey Open-Side Planer, Eight Foot Capacity, Twelve Foot Platen, Four Heads. Fine Condition.

REDUCING PRESSES

FOR DRAWING SHRAPNEL CASES 21" DEEP—Four No. 60½ BLISS, adjustable stroke from 4" to 42".

NEW SHAPERS IN STOCK

Twelve new 24" Hollingworth Improved Triple Geared Crank.

PIPE MACHINES

No. 9 Saunders, 8" to 16" capacity.
10" Cox, 4½" to 10" capacity.
No. 6 Saunders, 2" to 8" capacity.
8" Eaton, Cole & Burnham, 2" to 8" capacity.
6" Stoever, 1¼" to 6" capacity.
6" Curtis & Curtis, 1½" to 6" capacity.
4" Morris, 2½" to 4" capacity.
4" Armstrong, 2½" to 4" capacity.
2" Saunders, ¾" to 2" capacity.
2" Borden, ½" to 2" capacity.
2" Jarecke, ¾" to 2" capacity.

New York Machinery Exchange, Inc.

50 Church Street . . New York City

MACHINE TOOLS—HOW ABOUT THESE?

BOLT AND NUT MACHINES

BORING MACHINES

BULLDOZERS

CRANES

CUTTING OFF MACHINES

1—NEW 14" Davis.
1—Davis 6½"
1—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive. Data 1st.
3—NEW 3' American sensitive tapping attachment.
3—4' Mueller Plain speed box drive
1—Fay Full Universal, cone drive.
1—NEW 3' Western, Data with Motor.
2—NEW 5' Niles Universal, with motor.
1—5' Fosdick, Plain
2—NEW 6' Mueller speed box drive. Data 1st.
1—Pond 6' Universal.
1—NEW 6' Triumph motor drive. Data delivered

DRILLING MACHINES—Heavy Duty

2—NEW No. 2 Cyclone
3—No. 14 Cyclone
4—No. 310 Baker Single Pulley Drive, late type

DRILLING MACHINES—Sliding Head

2—NEW 24" Barnes Drills and Tappers.
5—NEW 4" Barnes Drills

DRILLING MACHINES—Multiple Spindle

GEAR CUTTING MACHINES

1—NEW No. 3 Barnett Gear Rack Planer delivery
1—NEW 6" Standard Gear Cutter, spur.
1—NEW 6" Gleason Bevel Gear Planer.

GRINDERS (Universal for Cutters, Drills, Reamers, etc.

1—NEW No. 00 Wells.
1—NEW Universal Grinder.
1—NEW Universal & Manufacturing Style B K
1—NEW Walker No. 1 Double B
1—NEW No. 1 Walker Universal
1—NEW No. 1 Walker Universal
1—NEW Walker No. 2 Double K capacity 9" x 30"
1—NEW No. 2 Cincinnati Universal.
1—NEW Landis

GRINDERS—Cylindrical Plain

1—NEW 8" x 9" Mueller, automatic feed.
1—NEW 20" x 8' Mueller, automatic feed.
1—NEW 24" x 8' Mueller, automatic feed.
1—NEW 6" x 20" Mueller, automatic feed.
1—12" x 8' Landis, self contained

1—NEW 6" Mueller, automatic feed.
1—NEW 8" x 20" Mueller, automatic feed.
1—NEW 6" x 18" Landis, automatic feed.
1—NEW 6" x 18" Landis, hand feed.
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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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WE MAKE THE TOOLS
AND
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Let us quote on your requirements.

1-3-5 Lancaster Street
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Rawhide,
Steel, Iron,
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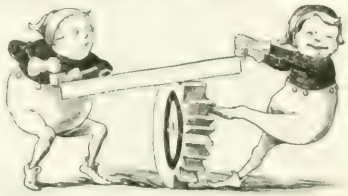

We Make Grinder Heads, Power Hack Saws,
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By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

You will be surprised at the saving you can effect.

We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

A Battery of presses is also available at our plant to manufacture parts for you with the understanding that you pay only for good parts made. Our facilities ensure prompt deliveries at right prices.

W. H. BANFIELD & SONS LTD.
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Steel Tubing, Butted and Welded for Bedsteads, Agricultural Implements, Trolley Arms, Fence Posts, Etc.

14 to 20 gauge.

Sizes 3/8" to 2" outside diameter.

Let us send you samples.

We are equipped with facilities for turning out big orders with the utmost dispatch. Prompt deliveries is one of our specialties.

Standard Tube & Fence Co.

Woodstock, Ontario

YOU'LL FIND WHAT YOU WANT

In the Classified Advertising Section of Canadian Machinery. Watch it each week for all kinds of new and used machinery.

YOU MAY WANT WHAT YOU FIND.

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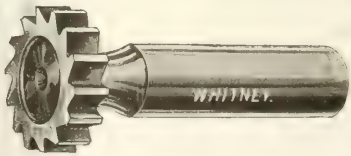
KEY-SEAT CUTTERS

For the Woodruff System of Keying

GET OUR PRICES



Either carbon or high-speed steel.
Material the best obtainable.
Unsurpassed in efficiency and durability.
Centred at both ends.
Unsurpassed in accuracy and finish.
Large quantities carried in stock.

The Whitney Mfg. Co., Hartford Conn.

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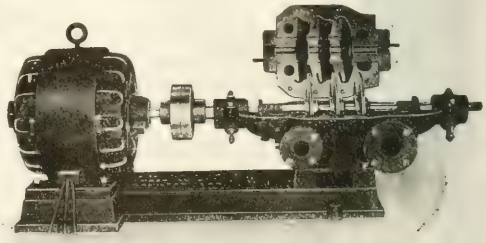
Have You Tried Them?

Smart-Turner Steam and Power Pumps

Vertical and Horizontal

Send us your inquiry, and let us show you their advantages.



The Smart-Turner Machine Co.
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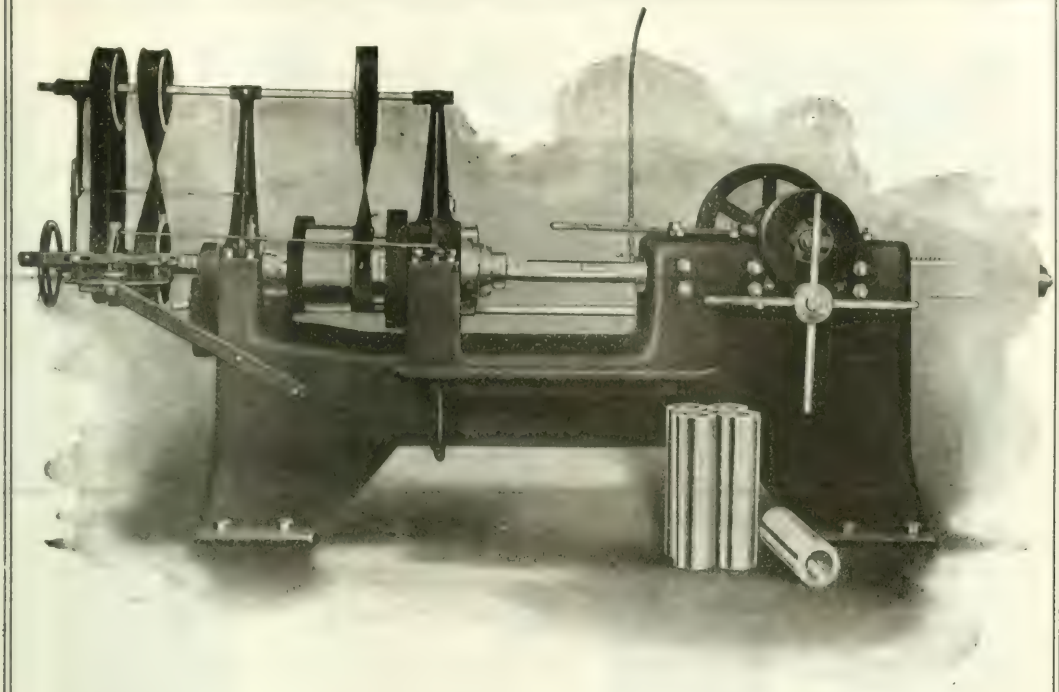

Cutting 6 Shell Costs

A Complete Rough Boring Unit with Patented Automatic Screw Chuck.

Convincing Facts:

Rough Bore **75** shells per 10 hour day.
Finish Bore **100** " " " " "

Study illustration, compare these figures with your own present output, then write us for complete data and specifications. An entirely new machine with entirely new results.

The Plessisville Foundry

Plessisville, Que., Canada

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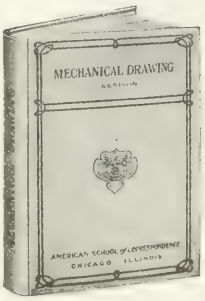
If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.

MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price **$1.50**



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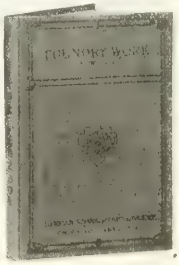

FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price **$1.00**

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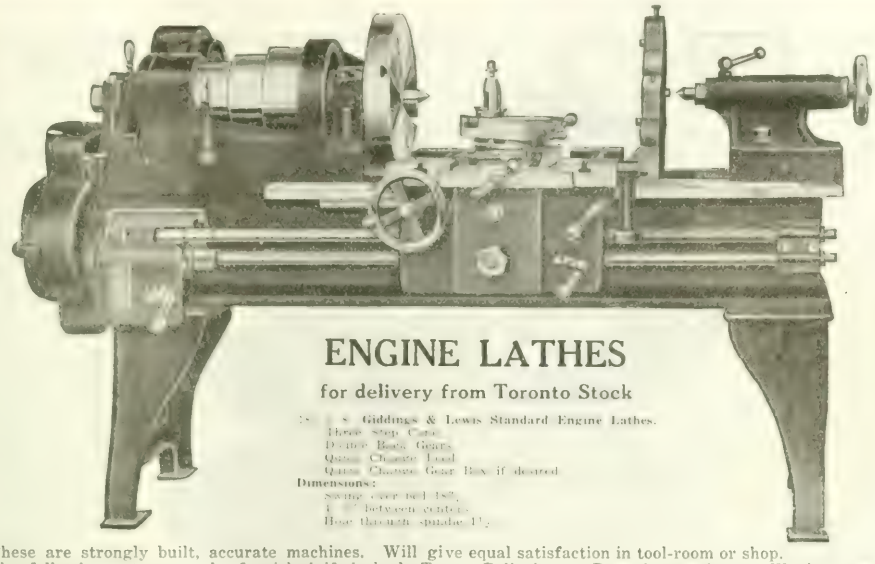

ENGINE LATHES

for delivery from Toronto Stock

[illegible] Giddings & Lewis Standard Engine Lathes.
Three Step Cone
Double Back Gears
Quick Change Tool
Quick Change Gear Box if desired
Dimensions:
Swing over bed 18".
[illegible]" between centers.
Bore through spindle 1".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop. The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan Pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**

Guaranteed Accuracy!

Mulliner Quick Change Lathes are guaranteed to bore and to turn true to within .001", when properly set up.

Only the finest materials and workmanship are used in constructing these lathes. Every Mulliner Lathe is tested to a standard which is way above ordinary requirements.

Circulars giving details on request

THE HEAD: Pan construction—rigid—backward deflection of front bearing impossible.

AUXILIARY QUADRANT: Allows for application of additional gears.

COMPOUND REST: All bearings fitted with bronze bushings.

DRAW-IN ATTACHMENT: Chucks range from ⅛" to ⅝". VARIABLE SPEEDS.

Mulliner-Enlund Tool Company

SYRACUSE, N.Y.

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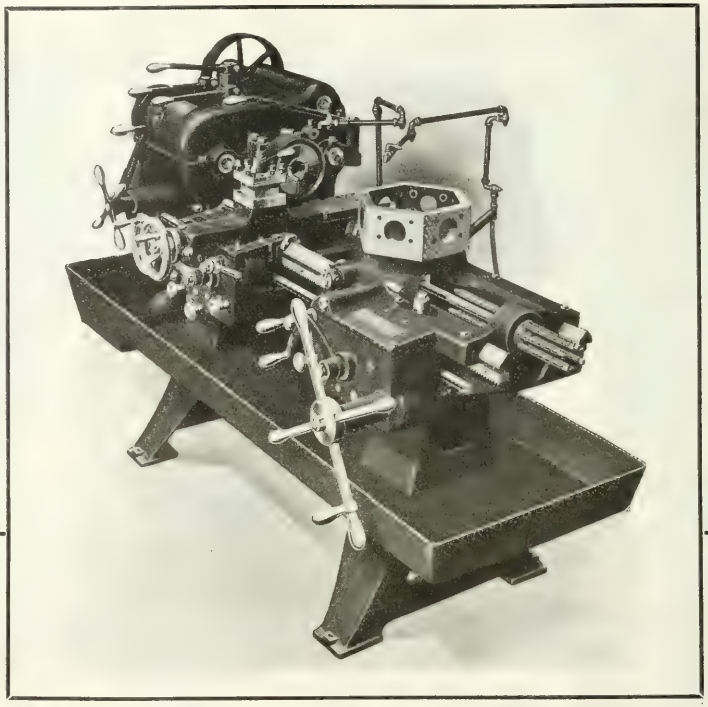

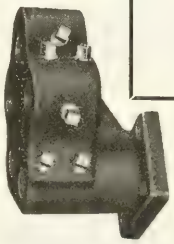

No. 147
Multiple Turning Head

No. 107 A
Cutter Holder

No. 144
Slide Tool

Chucking Equipment

These are only a few of the many standard chucking tools with which the 1-B Universal Turret Lathe can be equipped and which are doing their share toward establishing a ***new and higher standard for production per dollar invested.***

Foster Machine Co.

Elkhart, Indiana

REED-PRENTICE COMPANY

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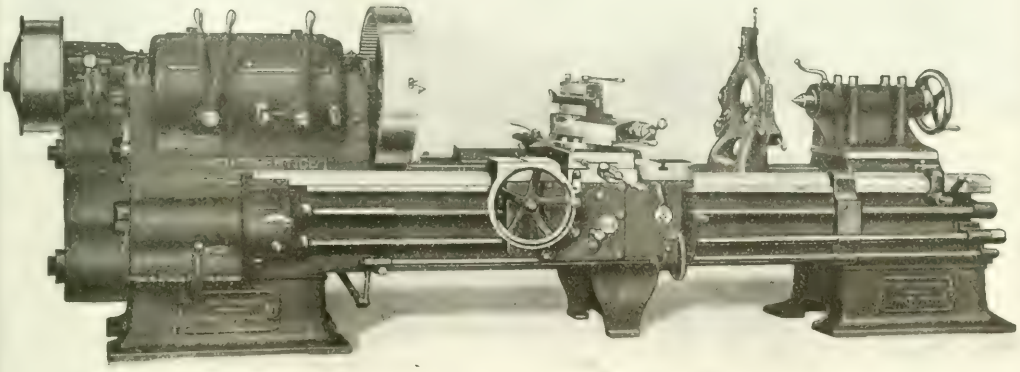

THE EXACTNESS OF FIT—THE HIGH STANDARD OF WORKMANSHIP AND THE CLEVERNESS OF DESIGN MAKE REED-PRENTICE TOOLS WHAT THEY ARE—THE BETTER TOOLS.

CANADIAN FAIRBANKS-MORSE COMPANY, LTD.

Manning, Maxwell & Moore, Inc., New York Allied Machinery Co. of America, Paris

Fenwick Freres, Paris

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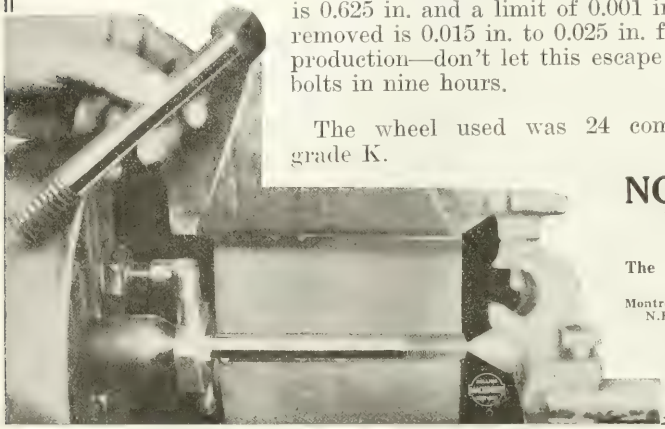
Grinding Operation on Front Axle Spindle Bolts

An interesting grinding operation in a large plant for manufacturing automobile parts in which accuracy is combined with good production is the grinding operation on front axle spindle bolts. The bolts are 6 in. long under the head, threaded 1½ in. long at one end, material steel, case-hardened. The diameter is 0.625 in. and a limit of 0.001 in. is allowed. Stock removed is 0.015 in. to 0.025 in. from diameter. And production—don't let this escape you—is 480 spindle bolts in nine hours.



The wheel used was 24 combination Alundum, grade K.

NORTON COMPANY
WORCESTER - MASS.

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The Canadian Fairbanks-Morse Co., Limited
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NORTON

852

ELECTRIC FURNACE PLANTS
Niagara Falls, N.Y. Chippawa, Ont., Canada

Dominion Cast Steel Parts

We are also prepared to furnish steel plate to 20" wide for prompt delivery.

We have recently increased the capacity of our plant and can guarantee quick delivery on castings weighing anywhere from 100 lbs. to 50,000 lbs.

Open Hearth Products

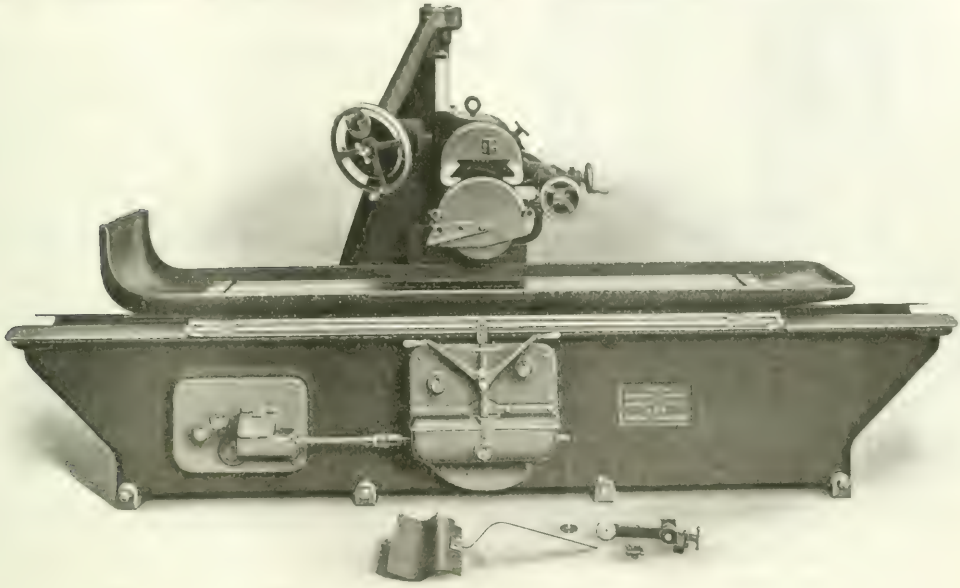
Machinery Castings of all kinds, Motor Frames, etc., for electrical trade, Pedestal and Miscellaneous Bridge Work, Rolling Mill and Blast Furnace Castings, Gears and Gear Blanks.

Quick Deliveries

Quality and Economy

DOMINION STEEL FOUNDRY COMPANY, Limited
HAMILTON - - ONTARIO

The New Norton



Features That Mean Production

The Wide Wheel

For the ordinary line of work the wheel is of 6" face. No automatic feed of the wheel is provided. But a hand traverse so locates the grinding wheel that the full width of the wheel face is utilized,—thereby production.

The wheel head can be raised to give a distance of 17" between the surface of the table and a 14" diameter wheel, thus making provision for use of magnetic chuck or supplementary table.

The Entire Working Surface

of the table can be ground in place. On all tables this is 15" wide and 6', 8', 10', 12' and 14' long, depending on the length of machine.

In addition to grinding all kinds of plane surfaces the Norton Grinding Machine can be used for grinding a variety of shape surfaces for which a special forming attachment is used to true the wheel face to produce the shape required.

Norton Grinding Co., Worcester, Mass.

Canadian Selling Agents: The Canadian Fairbanks-Morse Co.

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Note the Open Side

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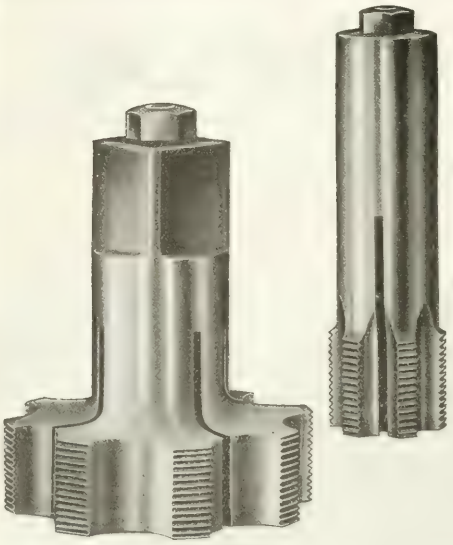


ADJUSTABLE FINISHING TAPS

Will they stand up? Will they produce?

These are questions which are uppermost in the minds of present-day buyers of *Adjustable Finishing Taps*. And they mean a great deal to manufacturers at this time, when deliveries are of such vital importance.

Are your threading jobs moving as fast as you would like to have them?

If not, tell us about it. We'll recommend a remedy for your threading troubles. If one of our standard products won't do, we'll prescribe a special tool. Forty years' experience and a factory devoted to specials enable us to give the best of service in screw-cutting problems.

Send for our general catalog. The most complete catalog of its kind published.

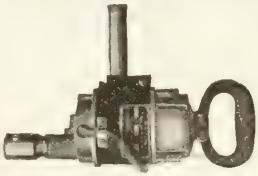
Wells Brothers Company of Canada, Limited

GALT, ONTARIO

Sales Agents: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

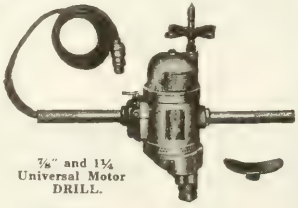
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅝ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

TRADITION

We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

QUALITY FIRST

P H

TRADE MARK
Quality Files

CANADA'S STANDARD

Made in Canada, by Canadians, for Canadians.

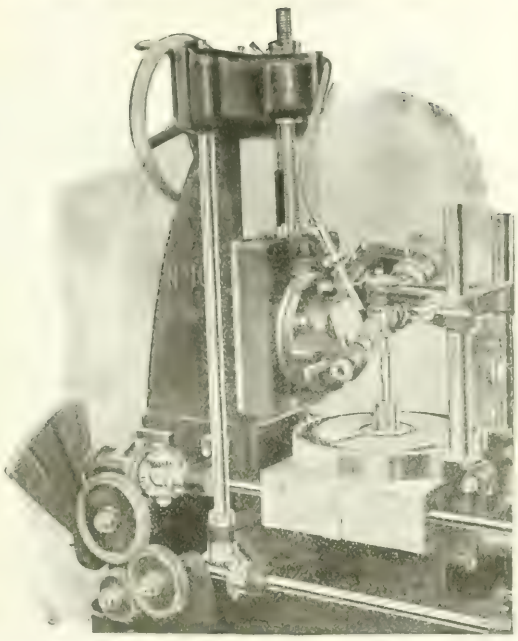
ARE YOU FILE-WISE?

PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber"

You know the "Bilton" Gear Hobber—But do you know what it will do?



You know that the "Bilton" is substantially built; that it embodies new features of operation and control; that it is fully automatic, etc. But do you know the interesting facts of its operation? Read below a few examples of economical production with a Bilton.

Cutting Malleable Iron Gears.

10 pitch, 70 teeth, 5-16 face. Twenty-three of these gears are mounted on the arbor, each setup taking 27 minutes to cut. This means that each gear is cut in 70 seconds or one tooth a second. One operator can easily attend to four machines.

Cutting Double End Spiral Gears.

One gear being 56 teeth, 20 pitch, 27½° angle, the other gear being 8 teeth, 26 pitch, 62½° angle. This gear has a ⅜ hole and is made of machine steel. The time for cutting the 27½° angle is 1½ minutes or 40 pieces per hour. On the 62½° angle the time is 3 minutes or 20 pieces per hour. One operator can attend to two machines on this work.

Production—The hobbing method compares very favorably with any other method of cutting gears as to accuracy and speed. The No. 10 "BILTON" Gear Hobber is built to withstand almost unlimited feed, in fact, the only limit is the finish you desire on the work. On the two jobs mentioned above, the feed was as follows: .126 feed on the spur gear and .040 on the spiral gears.

Will cut spur, spiral gears, worms and worm gears, also many other shapes of teeth and gears. Because of its wide adaptability it can be called universal in use. Gears cut on the "BILTON" Hobbing Machine are done accurately and economically. The Hob is working 100% of the time, without attention of the operator. Only necessary to load and unload blanks on arbor.

Capacity for cutting gears: Diametral pitch 10; outside diameter 10 in.; width of face 10 in.; weight of machine, 1,100 lbs.

We can give a guaranteed estimate of Bilton performance on your production. Send us blueprints of your work—or, better still, send us a few blanks and let us finish them, showing quality of work as well as time.

Catalog 30, with full details, on request.

MACHINE TOOLS Bilton BRIDGEPORT

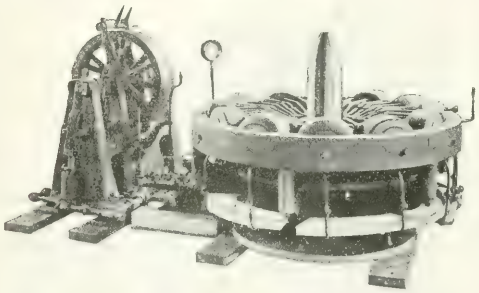
THE BILTON MACHINE TOOL CO.

BRIDGEPORT, CONN.

FOREIGN AGENTS:

Alfred Herbet, Ltd. M. Mett Engineering Company. Chas. Churchill, Ltd.

MACHINE TOOLS Bilton BRIDGEPORT



The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.
255 Mill Street, Rochester, N.Y.

Speed

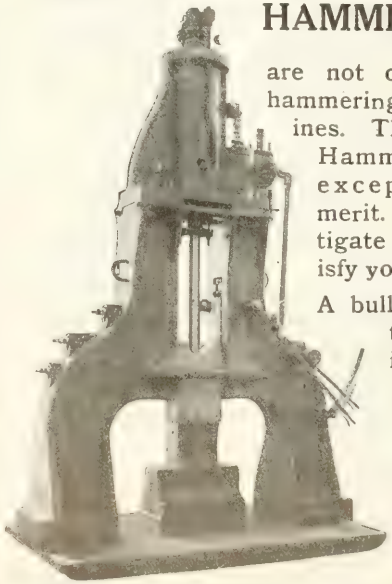
When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company
Bridgeport, Conn., U.S.A.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

ELMES' Forged Steel High-Pressure Fittings

They are made after a thorough study of the requirements of these fittings. Our manufacturing knowledge of the machines these fittings are for has given us an intimate knowledge of the strength required.

Write us for full information, prices, etc.

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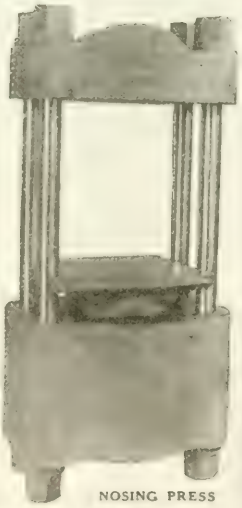

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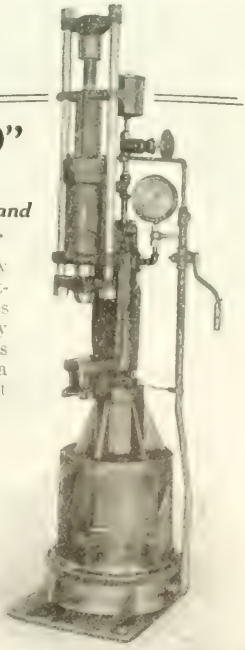

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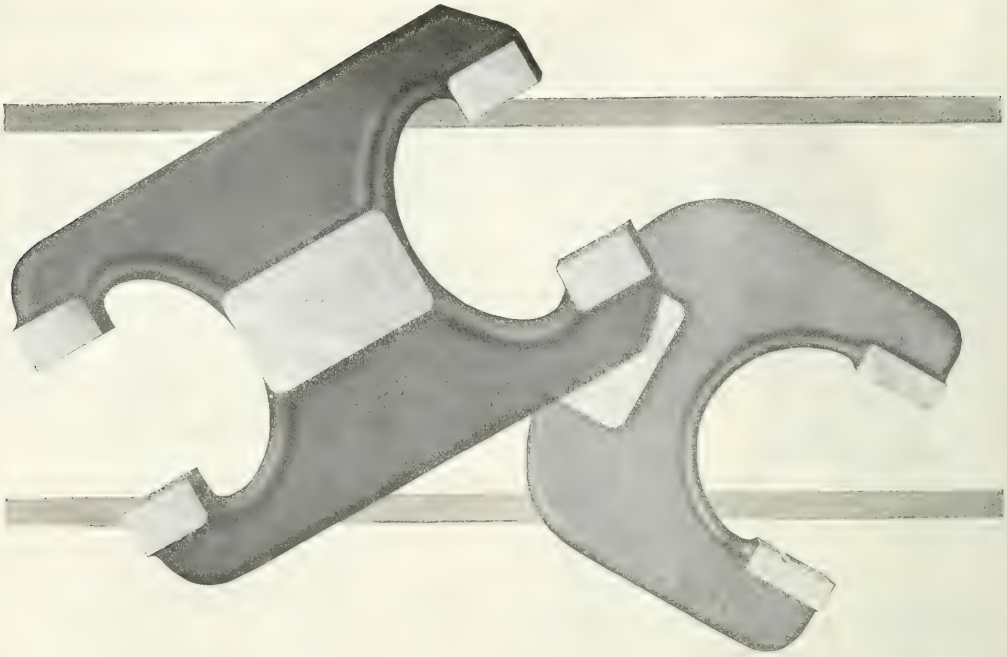

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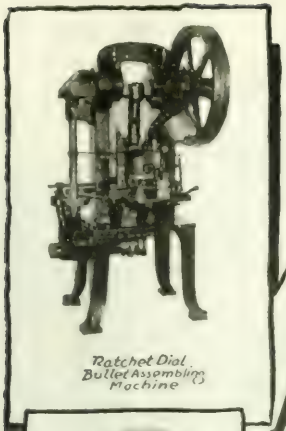
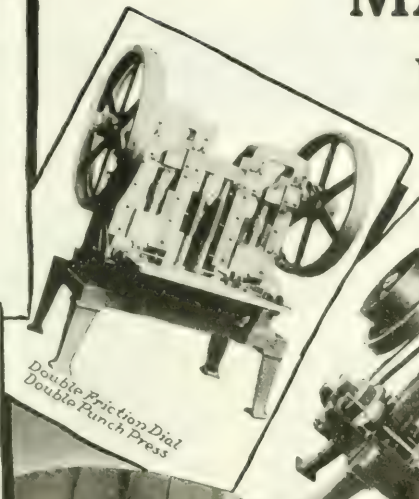
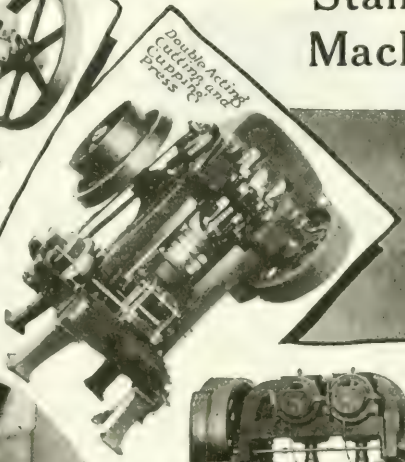


Ratchet Dial Bullet Assembling Machine



Double Friction Dial Double Punch Press



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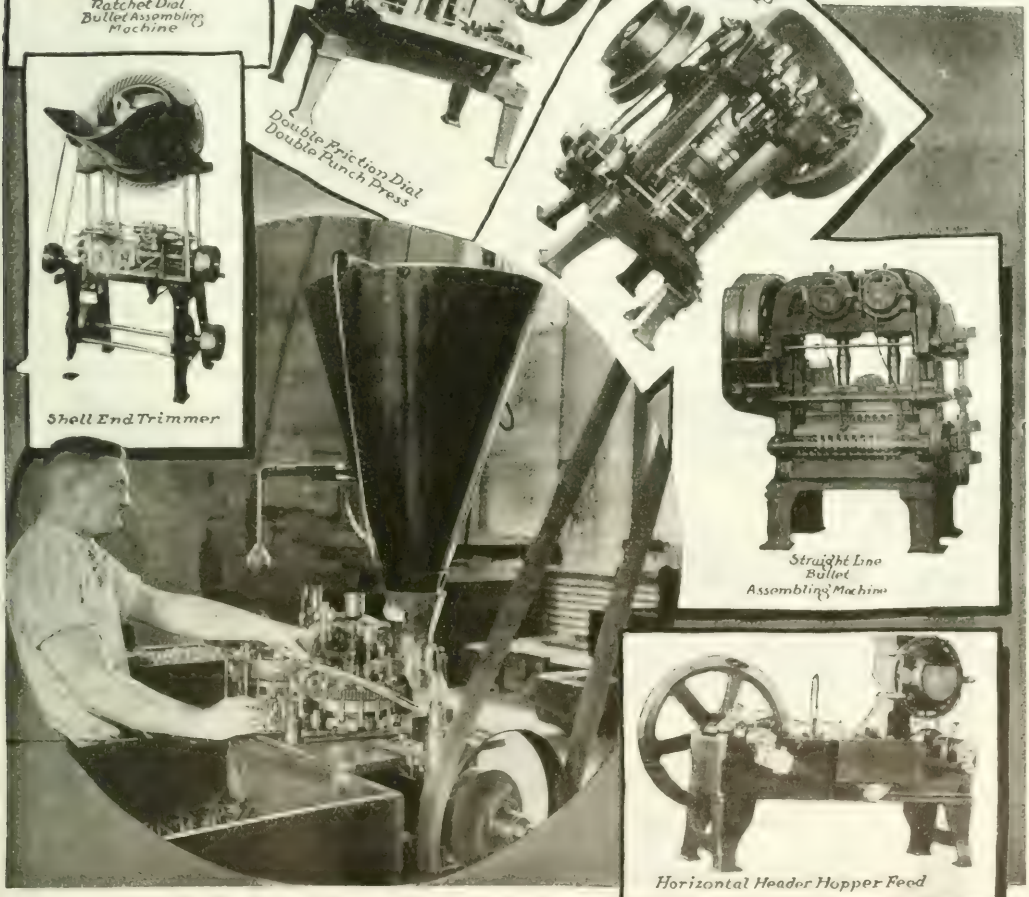
Straight Line Bullet Assembling Machine



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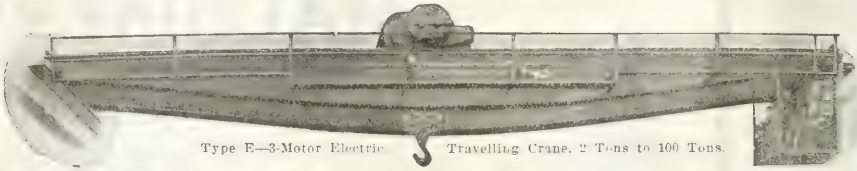

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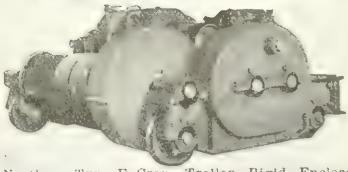

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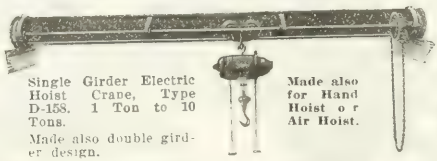

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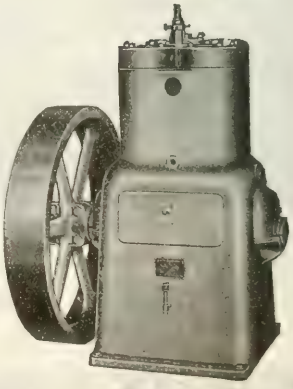

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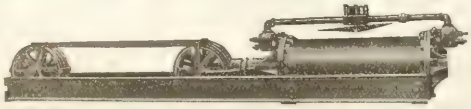

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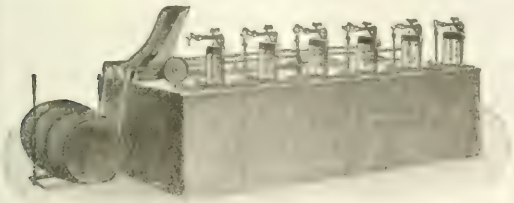

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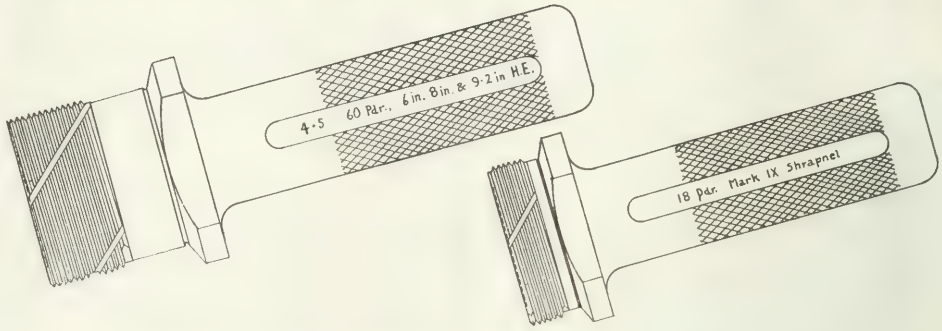

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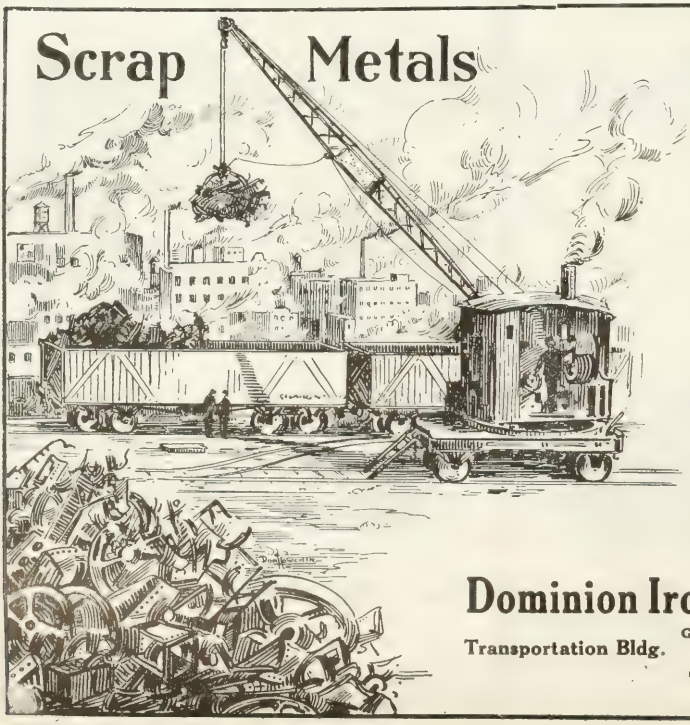

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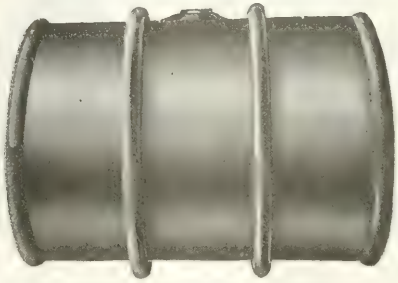

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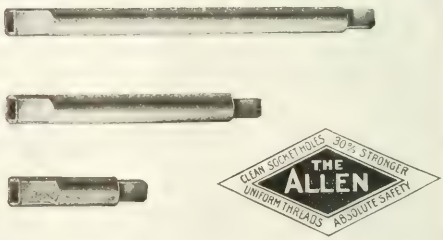

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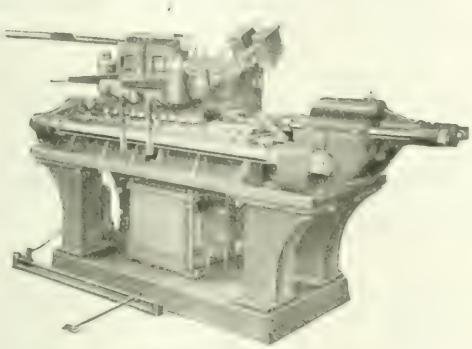
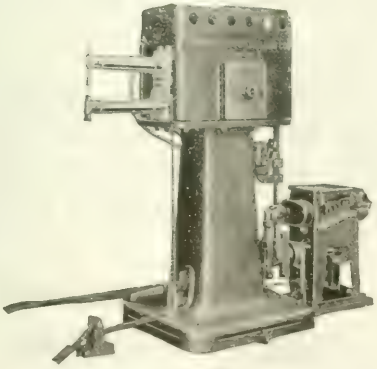


40-A-9
Butt Welding Machine



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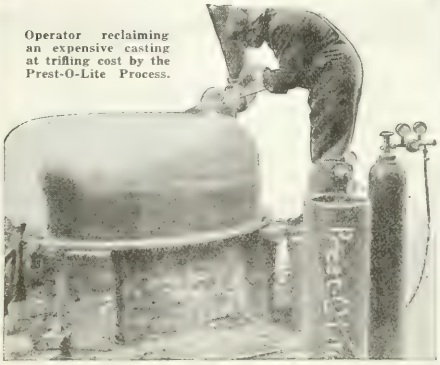

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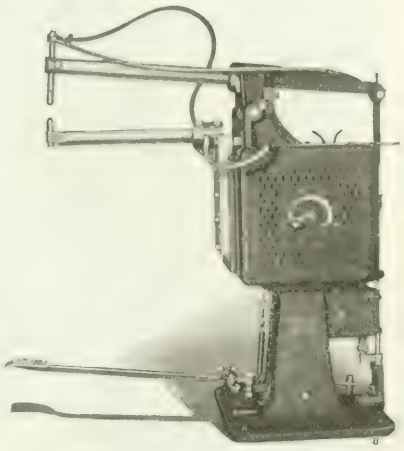

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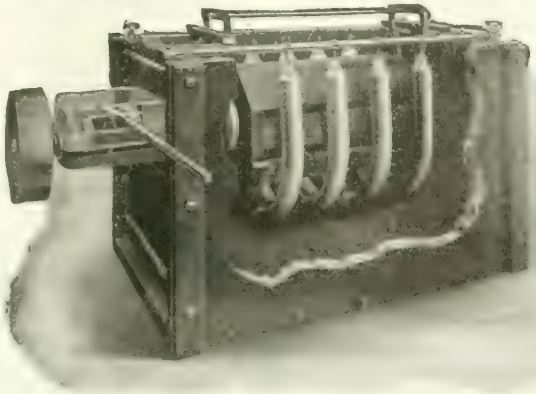
Mechanical Electro-Plating Apparatus



The C. H. & V. W. Mechanical Electro-Plating Apparatus Type B. Gear Drive.

Modern in every detail, particularly adapted for electro-plating quantities of small work in bulk. Saves time labor and material. Write for Bulletin No. 113.

Oblique Plating Barrel Apparatus

These machines are made in four sizes; they are smaller and less expensive than the Type B. A wonderful aid in plating screws and other small articles. Write for Bulletin No. 116.

We manufacture everything for *Polishing and Plating of Metals.*

CONSULT US AND REDUCE YOUR COSTS

CANADIAN HANSON & VAN WINKLE COMPANY, LIMITED

TORONTO - - CANADA

To Shipbuilders and Steel Corporations

THE Radiagraph is one of the exclusive developments by the Davis-Bournonville Company for mechanical cutting of steel plate, with the oxy-acetylene or oxy-hydrogen flame. With the radiagraph, steel plate and armor plate from 1 to 18 inches thick is smoothly cut at speed varying from 4 to 18 lineal inches a minute, according to thickness of steel. With the Oxygraph, another exclusive development, steel plate from 1 to 18 inches thick is readily cut in any direction, according to pattern or tracing, following straight or irregular lines, curves or sharp angles with equal facility. Extensively used by

Bethlehem Steel Company,
Youngstown Sheet & Tube Company,
Carnegie Steel Company,
Lukens Iron & Steel Company,
New York Shipbuilding & Dry Dock Company,
General Electric Company,
Westinghouse Electric,
Canadian Westinghouse,
American Locomotive,
Canadian Locomotive,
Lima Locomotive Company,
Marion Steam Shovel,
Camden Forge Company,
Pennsylvania Shipbuilding,
United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Washington, San Francisco and Seattle.

We are demonstrating the Radiagraph and Oxygraph throughout Canada, and if you are interested we would be glad to forward catalogue and price lists. "Davis Apparatus" leads the World for Range, Efficiency and number of Users.

Carter Welding Co. of Toronto, Limited

Canadian Agents for Davis-Bournonville

9 SHEPPARD STREET - - - TORONTO, ONT.

One of the 120

BELLEVUE FURNACES

This, our semi-muffle design, is for heating, case-hardening and annealing. Perfected combustion precludes the formation of oxidizing elements. The flame, not visible in the muffle, does not come in contact with the material. Practically no scalding possible.

A remarkable fuel economizer, for it heats up rapidly and holds heat long after burners are shut off. Bellevue illustrated catalogue gives full particulars.

Write.

Representatives in Canada:
H. W. Petrie, Limited, Toronto, Canada

Bellevue Industrial Furnace Co.

703 Bellevue Ave. - Detroit, Mich.
JULIUS C. HINZ, Pres.

CUTTING STEEL PLATES

With Oxy-Acetylene or Oxy-Hydrogen Torches

No. 2 OXYGRAPH

Cutting Plates ¼ to 20 inch thick. **Speed 4 to 15 inch per minute.**

This was one of the striking exhibits at the recent American Foundrymen's Convention in Boston.

The Oxygraphs, Nos. 1 and 2, and the Radiagraph, are exclusive Davis-Bournonville developments for mechanically cutting steel plate, ingots, billets and risers, with the oxy-acetylene and oxy-hydrogen flame. With the Oxygraph, steel plate up to 20-in. thick is cut in any direction, following pattern or tracing, along straight or angular lines, curves or sharp angles, with equal facility, at speeds varying from 4 to 15-in. or more per minute, according to thickness. The No. 2 Oxygraph is a heavy-duty machine, and with two torches, duplicate cuts are made, as in the illustration showing side frame being cut out for journal boxes. Frame of the machine moves back to permit service by shop crane.

Oxygraphs and Radiagraphs are extensively used by American Locomotive Co., Canadian Locomotive Co., Lima Locomotive Co., J. G. Brill Co., Lukens Iron & Steel Co., Bethlehem Steel Co., Carnegie Steel Co., Crucible Steel Co., Youngstown Sheet & Tube Co., Camden Forge Co., E. W. Bliss Co., Marion Steam Shovel Co., American Brass Co., United Shoe Machinery Co., General Electric Co., Westinghouse Electric & Mfg. Co., Canadian Westinghouse Co., New York Shipbuilding Corp., Newport News Shipbuilding & Dry Dock Co., Pennsylvania Shipbuilding Co., and in numerous other metal working plants, including United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Charleston, Washington, San Francisco and Seattle.

Broad basic patents Nos. 1,059,329 and 1,118,183 cover cutting torches and mechanical means for supporting and propelling same at uniform and determined speed.

Manufactured and sold only by the Davis-Bournonville Company, which has developed the widest range of equipment made for utilizing the oxy-acetylene and oxy-hydrogen processes of welding and cutting, and "Davis' Apparatus" leads the world for range, efficiency, and number of successful users.

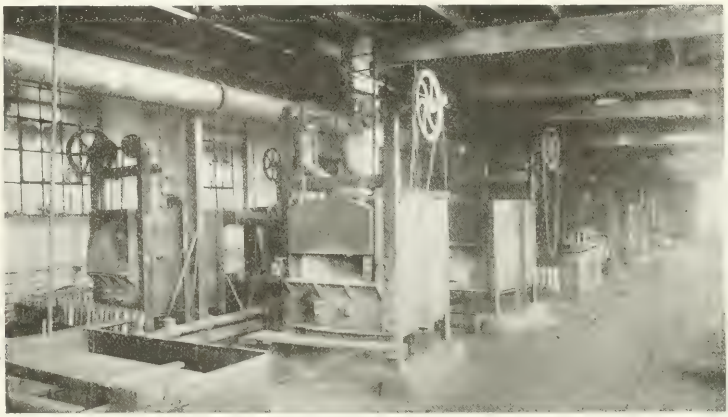
DAVIS-BOURNONVILLE COMPANY

General Offices and Factory: JERSEY CITY, N.J.

CARTER WELDING COMPANY, GENERAL DEALERS TORONTO

Canadian Factory, NIAGARA FALLS, ONTARIO

New York	Boston		Chicago	Detroit
Philadelphia	Pittsburgh	OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.	St. Louis	Seattle
Cleveland	Cincinnati		San Francisco	Toronto

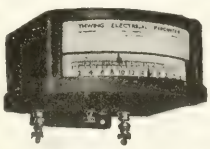


Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA



Insuring Accurate Temperature Measurements

THWING

HIGH RESISTANCE MULTIPLE RECORD

PYROMETERS

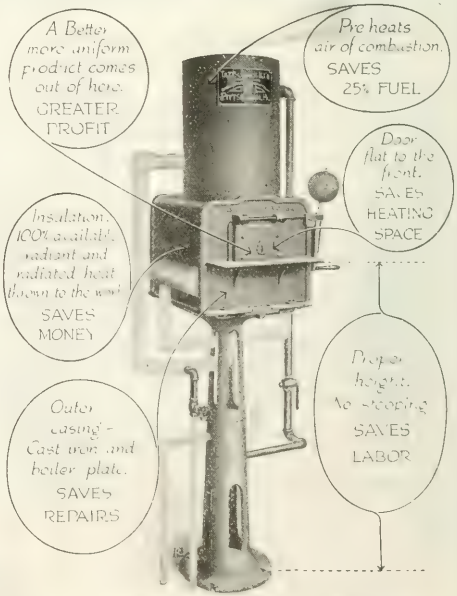
are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

Thwing Instrument Co.
34th Street and Lancaster Ave.,
PHILADELPHIA, PA.

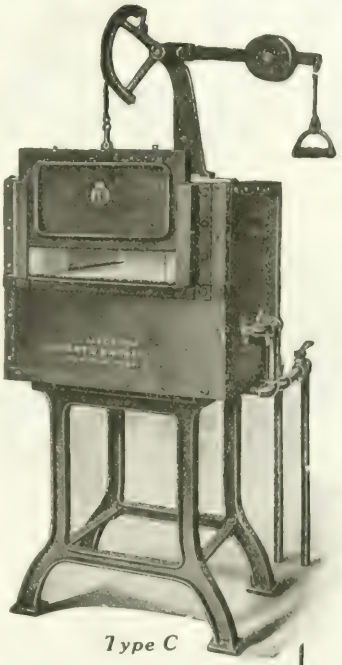

A Better, more uniform product comes out of here. GREATER PROFIT
Pre heats air of combustion. SAVES 25% FUEL
Door flat to the front. SAVES HEATING SPACE
Insulation 100% available radiant and radiated heat thrown to the work SAVES MONEY
Proper height. No stooping SAVES LABOR
Outer casing - Cast iron and boiler plate. SAVES REPAIRS

Six of the features that make this TATE-JONES RECUPERATIVE GAS OVEN FURNACE (Series A) a profitable one for the manufacturer. Write for full information to

Tate-Jones & Co., Inc., FURNACE ENGINEERS Pittsburgh, Pa.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

There is a half-century of experience back of every G. & B. Installation



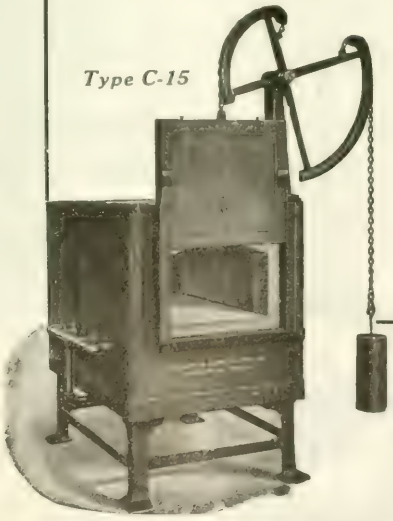
Type C

THE benefit of this long experience, which includes a thorough working knowledge of fuels, combustion and heat-treating methods is yours, whether you instal **one** Gilbert and Barker furnace or a **hundred.**

This should mean a great deal to you if you contemplate installing furnaces.

Gilbert and Barker furnaces are known for their dependability, wherever they are used. The experimental stage in their construction has been long passed. Year in and year out they give unequalled service to their users. It will pay you to investigate them. Our Engineering Department will gladly advise you.

We are now making delivery from stock on the smaller furnaces. All are made for either gas or oil fuel or can be furnished with combination gas or oil burners. Catalog 24 gives more details. You'll find it interesting.



Type C-15

In Gilbert & Barker Furnaces, heat loss from radiation is cut down to the minimum. Heavy walls and the high quality of the fire brick used retain the maximum amount of heat.

Linings are made of the very best grade of Pennsylvania Fire Brick, Hard Baked.

None but the best grade materials used throughout.

Repairs, when necessary, are readily made without disturbing the general construction.

We make both Gas and Fuel Oil Burning Heat Treating Furnaces in more than 100 standard types.

Gilbert & Barker Mfg. Co.

WEST SPRINGFIELD, MASS.

Canadian Agents:

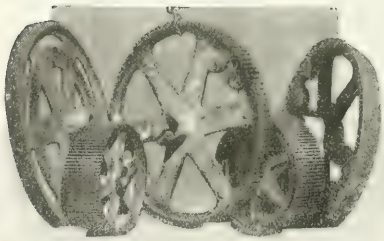
Williams & Wilson, Montreal, Que.

James DeVon, 227 Davenport Rd., Toronto, Ont.

If any advertisement interests you, tear it out now and place with letters to be answered.

CUT GEARS

CUT GEARS



Accurately cut gears
run quietly and endure.

Poor gears are noisy in operation. Their life is short.

It is economy to buy
HAMILTON GEARS—
they are cut right.

Any Style Any Size
Any Quantity

Send your blue prints and specifications for prompt quotation.

Hamilton Gear & Machine Co.
Van Horne Street, TORONTO

Philadelphia GEAR Works

VINE STREET PHILADELPHIA, P.A.

Spur, Bevel, Herringbone, Spiral and Intermittent

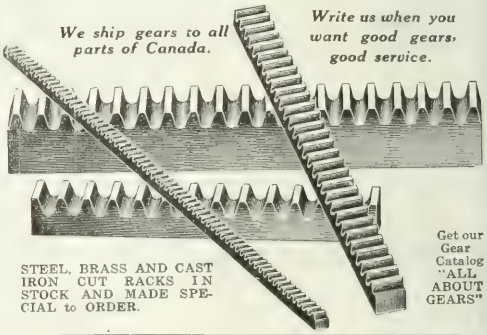
Gears and Pinions

Made in all kinds of metals, rawhide and fibre

SPROCKET WHEELS made to order.
DIAMOND CHAINS for Power Transmission, Machinery, Motor Trucks, Motorcycles and Bicycles.

We ship gears to all parts of Canada.

Write us when you want good gears, good service.



STEEL, BRASS AND CAST IRON CUT RACKS IN STOCK AND MADE SPECIAL to ORDER.

Get our Gear Catalog "ALL ABOUT GEARS"

Convinced?

Probably the impartial opinion of a user—not our claim alone—has carried weight with you. Perhaps you're convinced—almost. For the sake of better pulley service throughout your plant, now is the time to give the Bernard a trial.

The Bernard Wood Split Pulley

in material and workmanship, in appearance and finish, is precisely what it looks—a wood split pulley built to serve both best and longest.

But a trial is more convincing than our claims or a user's opinion. For your own sake, we urge a trial; also because repeat orders so frequently follow trial orders.

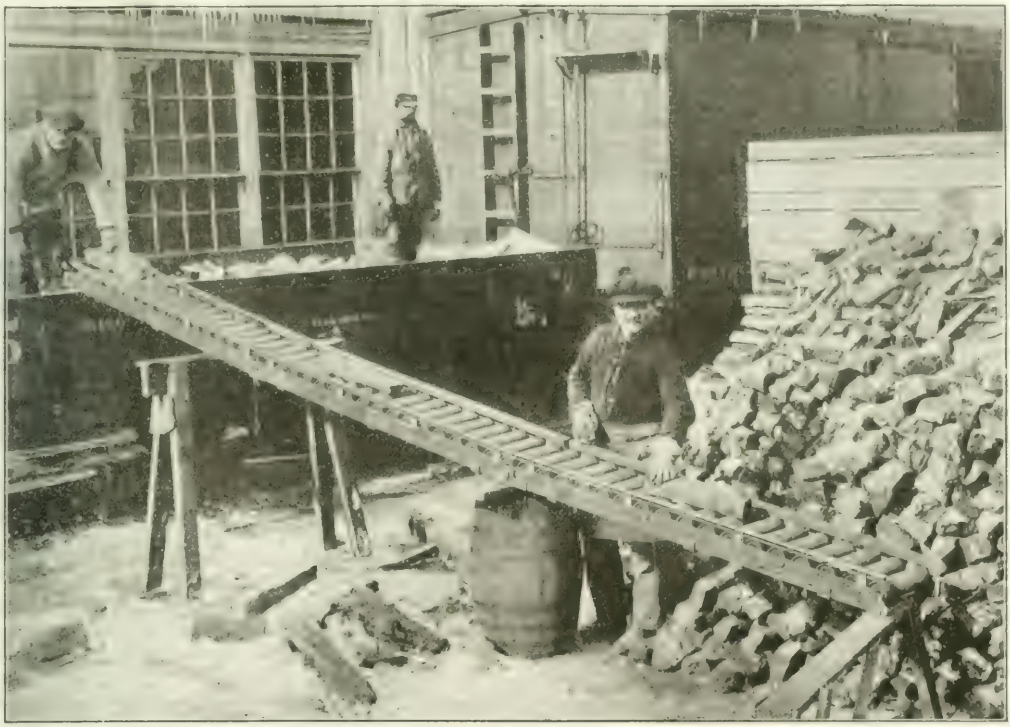
Write for prices and full particulars.

The A. Bernard Industrial Company

Manufacturers of High Grade Power Transmission Appliances.

Office and Works:
FORTIER VILLE, QUE., CAN.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



Do You Use or Handle Pig Iron?

If so, read the balance of this advertisement—it's worth your while.

The following were taken from letters written to us by **Canadian** users of our Pig Iron Conveyor:

"We might say we are getting good results from your Pig Iron Conveyor. We are sending to-day, to your Mr. Yates, an order for 30 ft."—(This is the second order.)

"In reply to your letter of June 21st, regarding the Pig Iron Conveyor which we purchased from you some time ago, we might say that it is a great success, and lightens the work of the men considerably."

"We are quite satisfied that in unloading Pig Iron from cars we have saved 50%."

Write for our Bulletin No. C

Canadian Mathews Gravity Carrier Co., Ltd.

484 Richmond Street West **TORONTO, ONT.**

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

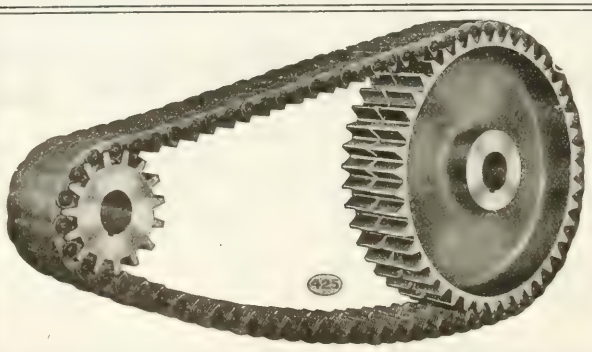
Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.



Jones & Glassco (Reg'd)

ENGINEERS
MONTREAL AND TORONTO
Specialists in
POWER TRANSMISSION CHAINS
CANADIAN AGENTS FOR
"RENOLD"
Patent Silent and Bush Roller Chains
"MORSE"
Rocker Joint Silent Chains
Chain Drives from ¼ H.P. to 5000 H.P. in successful operation
Write for particulars to

Head Office:
St. Nicholas Building
MONTREAL

Branch Office:
1204 Traders Bank Building
TORONTO

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by
THE CANADA METAL CO., LTD.
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED

Ten years ago—before we brought our Turbine to its present high degree of perfection—the manufacturing difficulties made it impossible to produce a solid rotor without semi-circular slots. These slots are acknowledged as highly undesirable and built-up rotors are never made with them. We finally invented and patented a process of manufacture whereby we were able to eliminate the slots and today unslotted buckets in solid rotor are AN EXCLUSIVE STURTEVANT FEATURE.

The unslotted bucket is obviously much stronger and permits of a thinner and more efficient vane. Furthermore it is self-evident that the slots encourage leakage from one bucket to the next and this further reduces the efficiency.

The unslotted bucket is just one of the superiorities of the Sturtevant steam turbine. The other advantages are given in detail in our catalogs 209 and 210, copies of which will be sent on request.

B. F. Sturtevant Company

of Canada, Limited, Galt, Ontario

MONTREAL TORONTO WINNIPEG VANCOUVER

Selling Agents for Sanford Riley Stoker Co., Limited, THE RILEY STOKER

Sturtevant

(TRADE MARK)

The Pulley of Maximum Efficiency

OVER 25,000 of these pulleys—the American Steel Split Pulley—are used in the plant of the Ford Motor Co. of Detroit.

More than 20,000 "Americans" are in use in the Western Electric Company's Chicago plant. Over 25,000 in the plant of the Cadillac Motor Car Company.

These marvelously efficient organizations use American Steel Split Pulleys for just one reason—*RESULTS.*

AMERICAN
STEEL SPLIT
PULLEYS

Transmit maximum power with minimum belt slip.
Are guaranteed for double belt duty.
Endure higher speeds than any other standard metal pulleys.

Write for Booklet "Pulley Efficiency."

The American Pulley Company, Philadelphia, Pa.

CANADIAN DISTRIBUTORS:

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LACO NITRO LAMPS

EMANCIPATE THESE PLANTS FROM THE SHORT WORKING DAY

The necessity for good light for the accomplishment of capacity production has made most of them slaves to the short hours of daylight. Now they are freed. Twenty-four hours are available and production and quality will be maintained.

In daytime skilled labor and high paid assistants perform their duties with accuracy and precision, but are you handicapping them during the dark hours and night shift by giving them insufficient artificial light?

Provide for your employees more hours of light in which to render efficient productions. Give them artificial light which will maintain their skilled capacity throughout the full eight hour day or night shift.

Protect them against accidents and error risks and make their working vicinity bright and cheerful by using

LACO NITRO LAMP "The Light That Gives More Light"

This nitrogen gas-filled electric lamp will flood every nook and corner of your establishment with the equivalent of bright sunlight. It will increase the value of your floor space. It prevents damage to tools and machines and "jacks up" the speed of production.

Low in operating cost and high in efficient service. Uses less current and gives a clearer, brighter light than heretofore possible. Scientifically constructed with tungsten filament substantially suspended in nitrogen gas-filled bulb, thus securing long utility under severe usage.

INQUIRE FROM YOUR NEAREST DEALER.

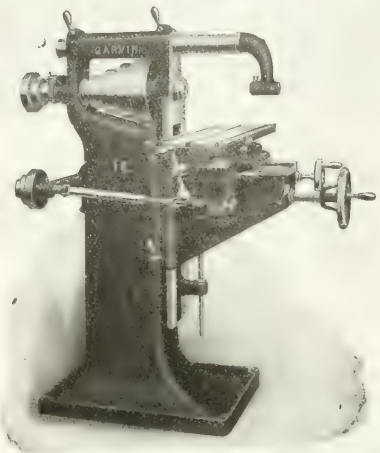
CANADIAN LACO-PHILIPS COMPANY

LIMITED

STOCKS AVAILABLE AT

MONTREAL TORONTO WINNIPEG VANCOUVER

GARVIN



No. 12 Plain Milling Machine—Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

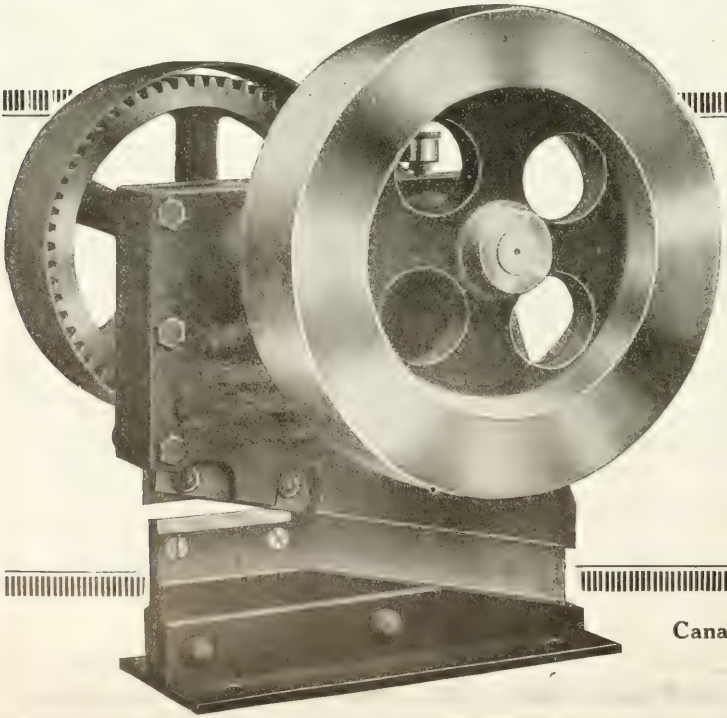
IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City



The Smallest Power Shear Made

This baby shear is only one in the comprehensive line of Buffalo "Armor Plate" Shears and Punches.

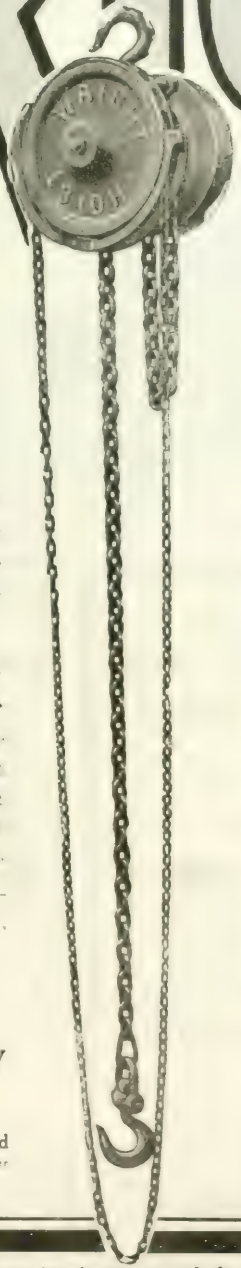
Stands only 17 inches high. You can anchor it on a work bench, shelf—in fact anywhere that convenience demands.

Cuts either flats, rounds or squares.

Ask for complete information —Dept. 16.

Canadian Blower & Forge Co.
Kitchener, Ont.

WRIGHT



High Speed STEEL Hoists

IN every working part, in every load-sustaining part, are strongest steel and malleable iron—*not* cast iron. That is why Wright Steel Hoists

NEVER BREAK

With ease and speed they raise or lower from any angle the heaviest loads, the Wright Non-Fouling Chain Guide preventing absolutely all jerking or clogging of the Chain.

Wright Steel Hoists eliminate expensive repairs for parts broken, because they never break.

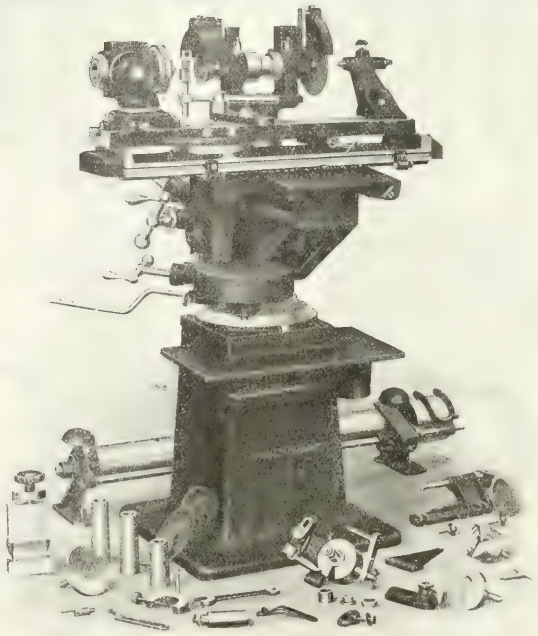
Write for Catalog.

Wright Mfg. Company
Lisbon, Ohio

Canadian Agents
A. R. Williams Machinery Co., Limited
Toronto St John, N B. Winnipeg Vancouver

"Steel Hoists Never Break"

If any advertisement interests you, tear it out now and place with letters to be answered.



Investigate Your Cutter-Sharpening Facilities

Our wide experience in milling has proved the necessity of having exactly the correct clearance on cutters. But cutter grinders were too incomplete to insure reproduction of the right clearance on repeated grindings. We set ourselves the task of solving this difficulty. The 40 per cent., 50 per cent. or 60 per cent. increased output that proper clearance means was certainly worthy of our best efforts. In the No. 1½ UNIVERSAL CUTTER AND TOOL GRINDER we offer you the result—a simple, correct clearance angle feature.

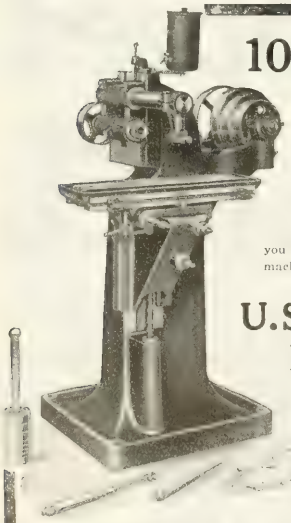
The machine carries a graduated dial on its headstock spindle from which the clearance angle for all cutters may be read direct.

As a result of obtaining this correct clearance angle the feed may be greatly increased, the cutter cuts as it was designed to; the tendency to chatter is removed—and you get greater efficiency from your millers.

Send for the Bulletin and Get the Whole Truth of the Matter.

Cincinnati Milling Machine Co.
Cincinnati, Ohio, U.S.A.

Canadian Agents: H. W. Petrie, Ltd., Toronto, Ont.; H. W. Petrie of Montreal, Ltd., Montreal, Que.; Taylor Engineering Co., Ltd., Vancouver, B.C.; General Supply Co. of Canada, Winnipeg, Man.



1000 H. P. TO SPIN A SPOOL

does not sound logical. But in a sense it is what you are doing every time you utilize your big milling machines on little jobs.

U.S. Improved HAND and WEIGHT MILLING MACHINE

is a little giant on little jobs. Simple in adaptability. Wide in its range of usefulness. Users say it does work faster and more accurately than big machines and at a cost-saving of almost half. More power for its size than any other milling machine made.

We'd like to explain

The United States Machine Tool Co.
CINCINNATI, OHIO, U.S.A.

For Rapid Production and Accurate Work

USE THE

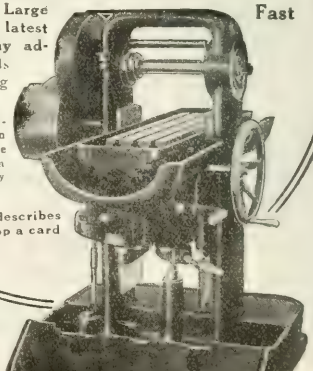
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant.

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Our booklet describes fully. Drop a card for it.



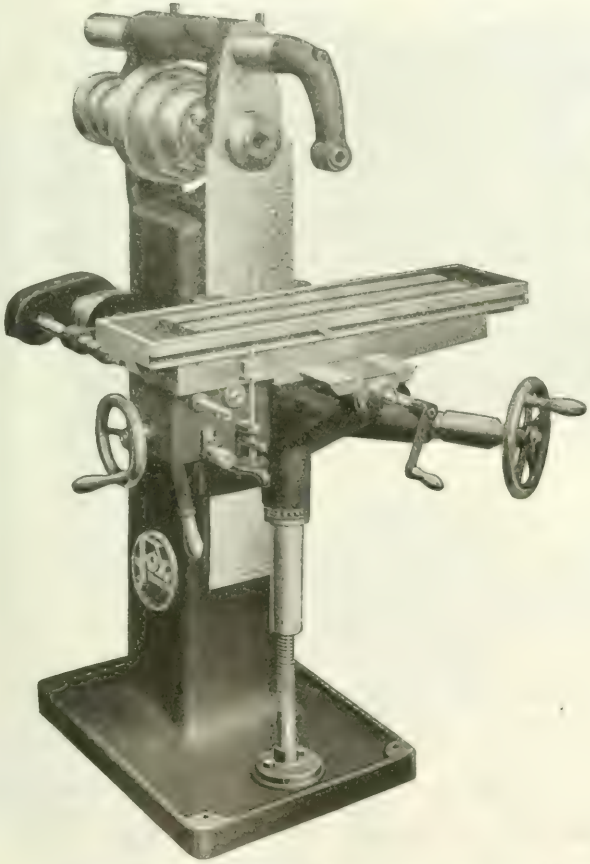
Gooley & Edlund
Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia. San Sebastian, Spain.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

The Fox Milling Machine

For Intense Production



Fox

MILLING MACHINES

lead the field

Power Feed Milling No. 3

The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

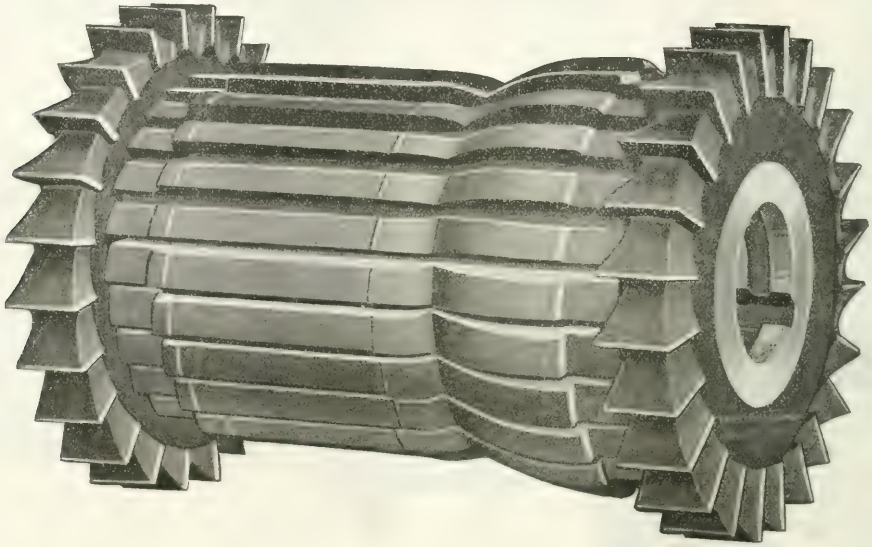
Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY

1047 W. Ganson Street, Jackson, Michigan

This Tool Does Accurate Work!



This special Form Cutter is used in connection with the manufacture of rifle parts, and these parts must be so milled that they are interchangeable; consequently each part is severely gaged, both with respect to shape and size. These cutters must also produce parts in large quantities, and are therefore so made and heat treated as to allow maximum speeds and feeds with the fewest possible grindings, as it takes time and costs money to sharpen large gangs of Formed Cutters.

If you are having trouble in getting production from your cutters and find it difficult to make milled surfaces meet your gages, let the Cleveland Milling Machine Company take the responsibility. Intricately designed tools are a specialty with us and we have equipment that enables us to offer you good tools delivered quickly.

We solicit your orders for tools that are now proving troublesome to you.

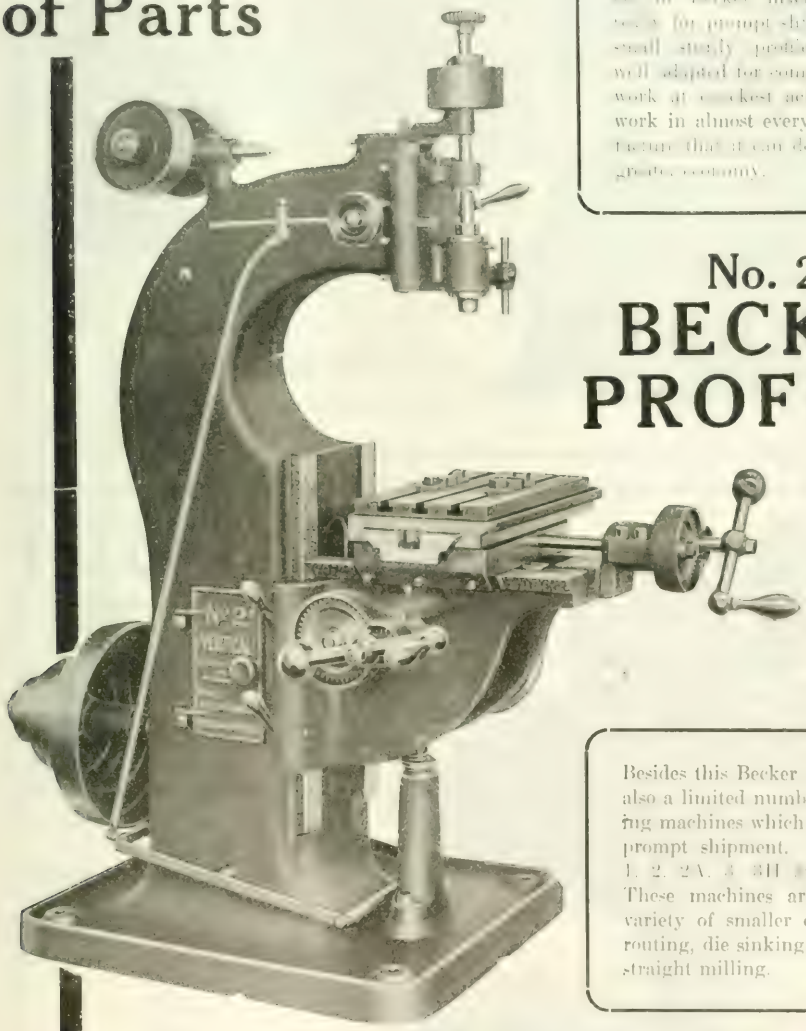
A full line of standard cutters and formed tools

Cutters carried in stock by our agents, The Dale-Brewster Machinery Co.
547 Washington Blvd., Chicago, Ill. New York Office, 30 Church St., New York City, N. Y.

The Cleveland Milling Machine Company

18511 EUCLID AVENUE - - CLEVELAND, OHIO

Here's the Machine for Rapid Duplication of Parts



These slides are of the finest construction of Becker machines in stock ready for prompt shipment. It is a small sturdy profiler, exceedingly well adapted for comparatively light work at quickest action. There is work in almost every line of manufacture that it can do best and with greatest economy.

No. 2H BECKER PROFILER

Range, 16" x 8" x 16".

Greatest distance between spindle and table, 17". Greatest distance between spindle and neck, 15". Spindle adjustment, 2". Weight, net, 1150 pounds.

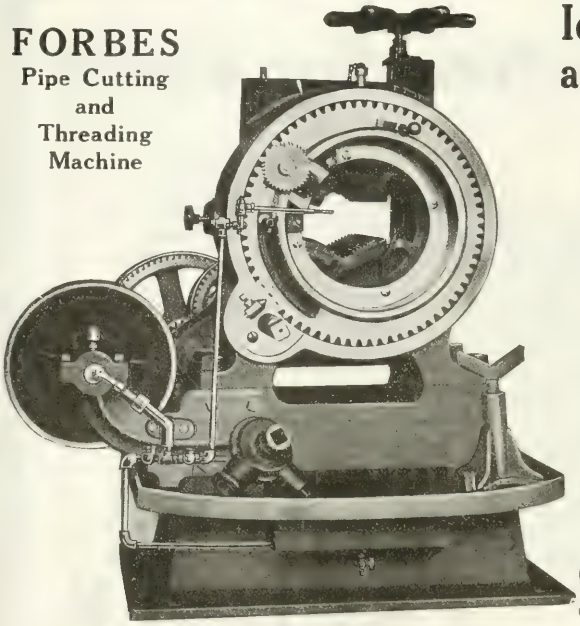
Besides this Becker Profiler we have also a limited number of the following machines which we can offer for prompt shipment. These are Nos. 1, 2, 2A, 3, 3H and 4B vertical. These machines are adapted to a variety of smaller class work from routing, die sinking and profiling to straight milling.

Full specifications and information gladly furnished on application.

Becker Milling Machine Co.
Hyde Park, Boston, Mass., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

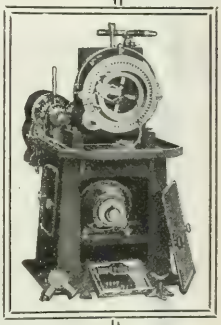
FORBES
Pipe Cutting and Threading Machine



Ideal Machine for all Kinds of Work

Especially Fine Work

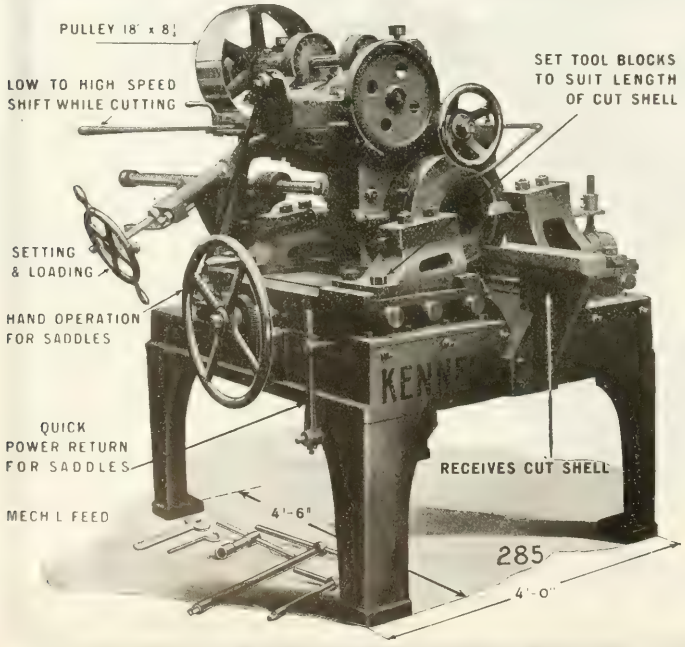
The "Forbes" is the ideal Pipe Cutting and Threading Machine for any job, but it is especially essential where the work in hand is of a high class order—where the reputation of your firm is at stake. Joints threaded by the Forbes Machines will bear the most critical inspection. They never leak.



It is the only machine on the market with receding gear which carries the dies into the pipe. It is also entirely self-contained, motor-driven and can be easily carried to its work.

Catalog on Request

Curtis & Curtis Co.
Garden St. Bridgeport, Conn.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

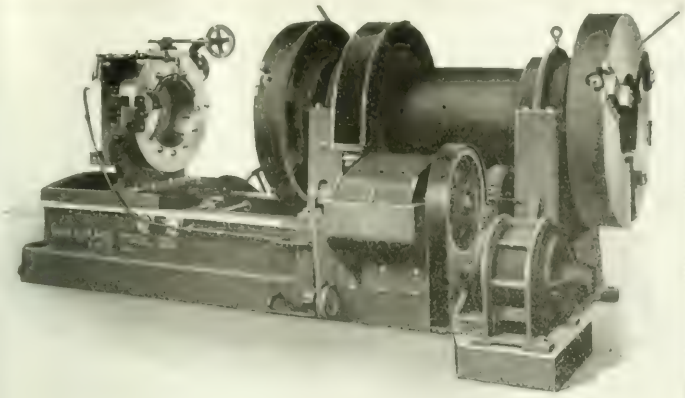
Forgings load in one end and discharge out the other when cut

A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The Wm. Kennedy & Sons, Limited
Owen Sound



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading

Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

HALL

Pipe Threading Machinery

AND

Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

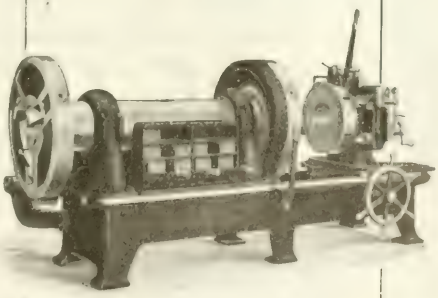
Pipe Threading Machines — Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛ to 18.

John H. Hall & Sons, Ltd.

BRANTFORD, CANADA

EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

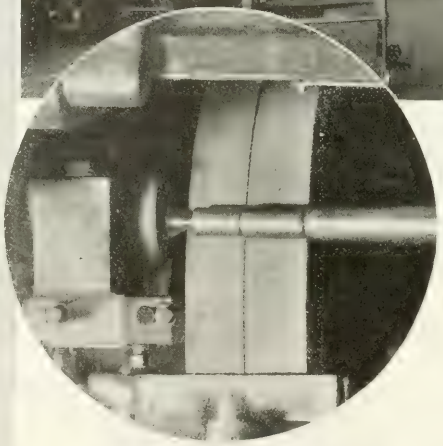
Made in Canada



Capacity

2½" to 8"

inclusive



How Aloxite Wheels Help To Keep Up Production Records

IN a big Toledo plant, making an automobile equipment, Aloxite Wheels are recognized as mighty big factors in keeping up production records. ¶One job for instance is grinding machine steel spindle bearings, a step wheel being used to grind two different diameters at one operation. ¶Aloxite Wheels grind 125 to 150 pieces at a dressing, finishing 100 to 125 per hour or from 800 to 1,000 in an eight hour day. ¶About .020 stock is removed and the work is done on a battery of Brown and Sharpe machines.

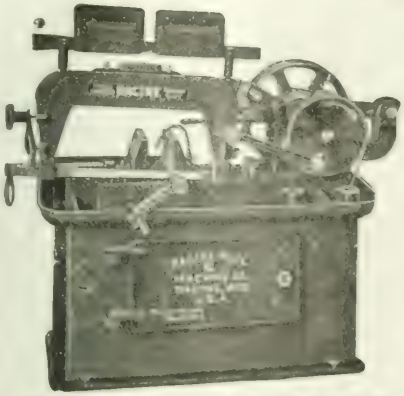
Again it's a case of Carborundum service—A case of studying every grinding phase and giving the right wheel in the right place.

Such grinding service is at your service.

The Carborundum Company, Niagara Falls, N. Y.

New York Chicago Philadelphia Cleveland Cincinnati Pittsburgh Boston Milwaukee Grand Rapids

NO DRAGGING BACK ON THE NON-CUTTING STROKE



To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

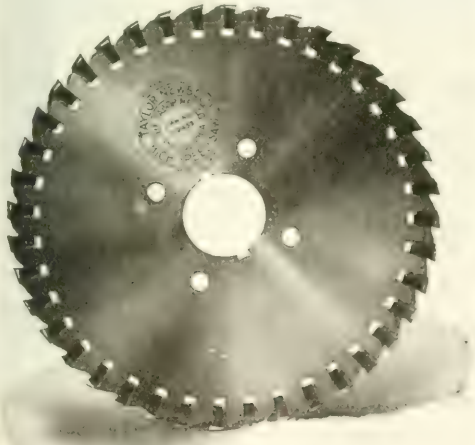
Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168—or if you'd let us ship a Racine on trial terms that you consider fair.

Write us to-day.

RACINE TOOL & Machine Co., 15 Melbourne Ave., Racine, Wis., U.S.A.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, U.S.A.

DOUBLE SAVINGS
in cutting on PEERLESS HIGH-SPEED METAL SAWS: they save both Time and Material.

Supposing you save only 1/16 on each cut, 30% lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

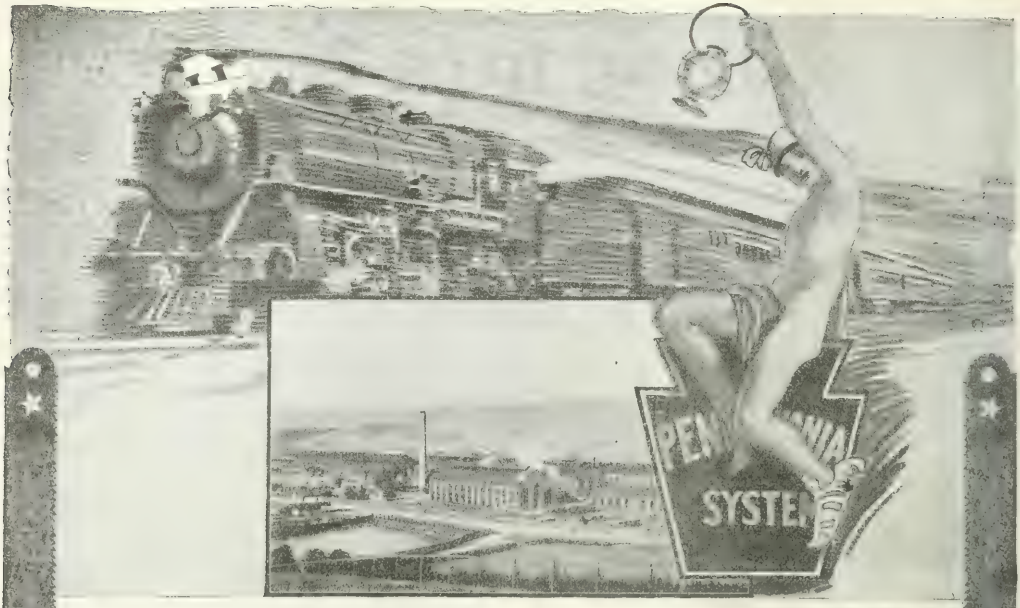
Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large contracts having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users, some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



The Pennsylvania Uses Star Blades

The Pennsylvania Railroad, often called the greatest railroad system in the country, uses Star Hack Saw Blades. No higher endorsement than this could come from the big railroads which are famous for putting tool efficiency above every other consideration in shop equipment.

The largest hack saw users whose names are household words in Industrial America—have adopted Star blades after exhaustive tests and continued to use them year after year because Star blades give such unequalled service.

Whether your shop is large or small, if you want the greatest efficiency in metal sawing you must follow the example of these industrial leaders and use Star blades.

Make a comparative test yourself of hack saw blades, testing a number of each kind for a fair basis of judgment, and

STAR HACK SAW BLADES

will prove out first on any test—for endurance, for speed or for low-cutting cost. It couldn't be otherwise because more time and money and scientific effort have undoubtedly been put into the development and perfection of Star Blades than all other hack saws put together.

The standard steel composition and tempering used in the Star Blade—the relative gauge and dimensions—and the shape and setting of teeth for different kinds of cutting, have all been adopted after thousands of tests of all possible combinations.

At every stage the uniformity of Star Blades has been made absolutely certain by special automatic machinery with gauges to the finest limits that make the blades as nearly identical as is humanly possible. At the same time this special machinery gives us an enormous quantity production at a minimum factory cost.

The Star was the first blade and its thirty years of quality leadership has kept it the largest selling blade in all that time. To-day this quality is higher than ever before, as the most exacting tests or drastic use will prove.

If you are not satisfied with the metal-cutting results you are getting or need help in your cutting problems, write our Millers Falls office, 230 River St. Our Engineering Department and the results of our years of research are at your service.

$500 Contest Closes Soon.

Don't delay in sending your answer to our Hack Saw Testing Contest. It closes November 30th.

Our thirty years' experience has shown us how few users grasp the fundamentals of metal sawing efficiency and their application to varying conditions.

To stimulate a greater interest in this important subject, we have offered prizes of $500 in gold for the best statement of "How I Test Hack Saws." A literary production is not what we want.

Write us in your own way—What you look for in hack saw blades and why—How you decide which blade to buy—How you determine the most efficient way to use the blades on different kinds of material.

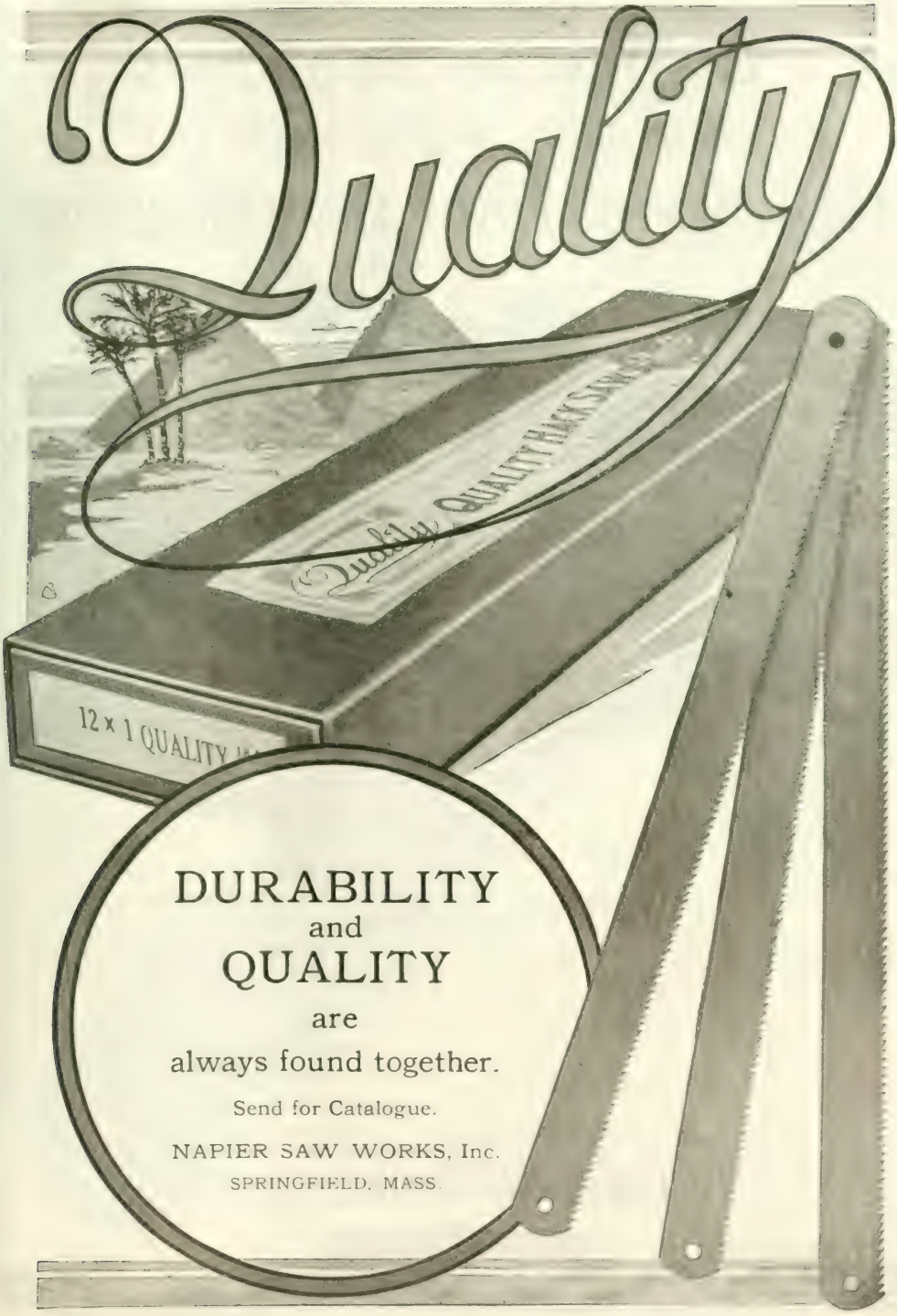
The answers that describe the simplest and most practical methods will win the prizes.

The names of winners and some of the best topics will be published in our advertising. Write for any further information desired.

Get your answer in at once. Contest closes in Millers Falls November 30th.

Manufactured By
CLEMSON BROS.
MIDDLETOWN, NEW YORK

Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.



DURABILITY
and
QUALITY
are
always found together.

Send for Catalogue.

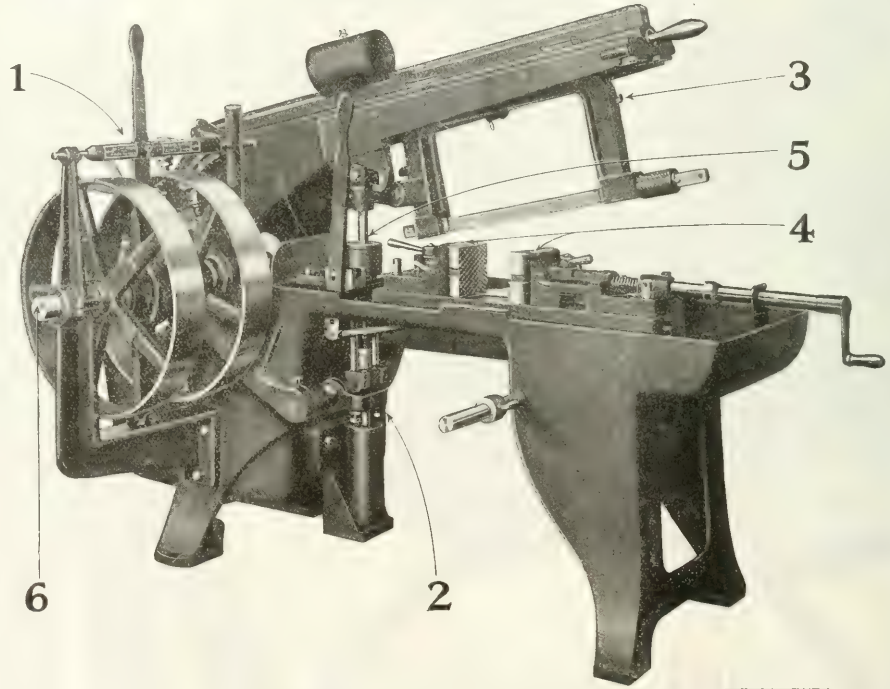
NAPIER SAW WORKS, Inc.
SPRINGFIELD, MASS.

If any advertisement interests you, tear it out now and place with letters to be answered.

Distinctive Features

of the V.S.W. No. 5

High Speed Hack Saw Machine



DISTINCTIVE FEATURES

1. Two Speeds
2. Shock Absorber
3. Extension Frame
4. Patent Swivel-Jawed Vise
5. Automatic Patent Lift
6. Frame Swings on Shaft Center
7. Rotary Pump.
8. Knock-off
9. Frame Bearings
10. Tank.
11. Perfect Blade Alignment
12. Lubricating System
13. Draw-Cut

For Explanation of these and other features send for Circular

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA

"STERLING" HACK SAWS

To-day the word EFFICIENCY means more to the manufacturer, than in any other industrial period that he has ever passed through.

It will mean a survival of the fittest. To get efficiency in manufacturing, the best tools are necessary.

Among metal workers in all lines a HACK SAW BLADE is indispensable.

The "STERLING" Blade must be good, for its many users, the world over, say so.

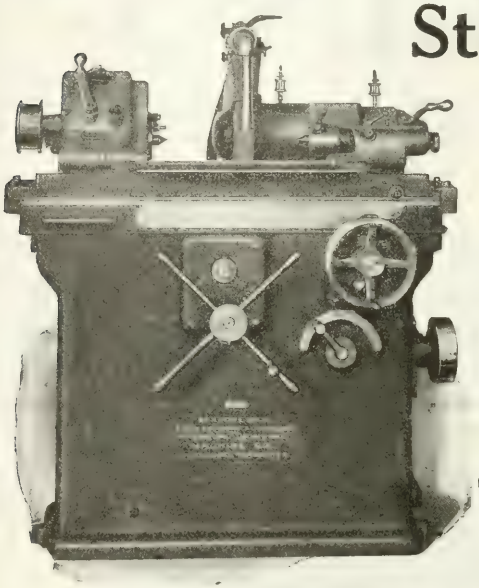
MANUFACTURED BY

Diamond Saw & Stamping Works

BUFFALO, N.Y., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

Specially Adapted for Grinding Straight or Tapered Shafts



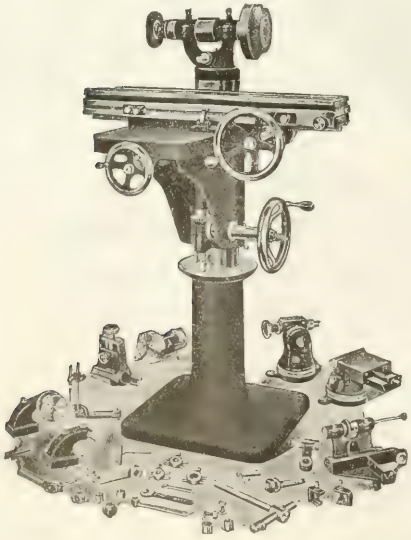
The Fitchburg Grinder illustrated weighs about 4,100 pounds and occupies 52" x 66" floor space. In design it is conveniently compact; in build, uncommonly strong. It will save you price cost in the first place and repair cost later on. Occupies much less floor space, and, at the same time, does all the various grinding work with equal if not greater speed than machines of much larger capacity. **Write for interesting facts and Catalogue.**

Fitchburg Grinding Machine Co.
FITCHBURG MASS. U.S.A.

The *Greenfield*

Universal Grinder

For General Tool Room Work



This Grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished and will be found a dependable, convenient grinder.

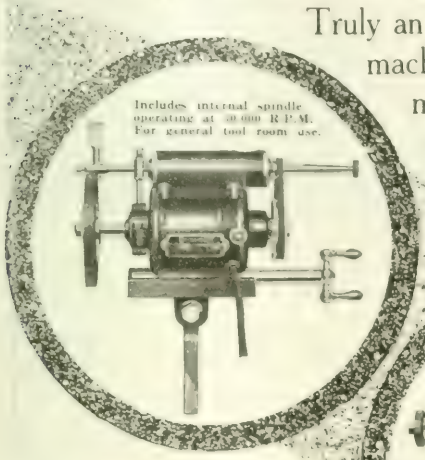
Greenfield Machine Company
Greenfield, Mass., U.S.A.

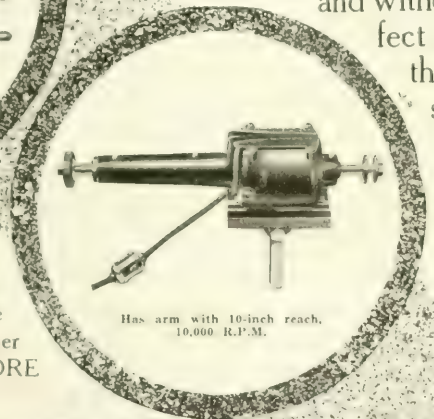
Accuracy-*with* Speed

A portable electric grinder with a speed of 30,000 R.P.M.

Truly an achievement of the utmost importance to the machinery world---a speed at first declared by many to be an impossibility until they had seen the machine in operation.

Yet this intense speed would be useless if the grinder did not run smoothly and without vibration. Perfect running balance in the DUMORE is secured by dynamically balancing the armatures. This is done on a special balancing machine of our own design---all vibration is eliminated.

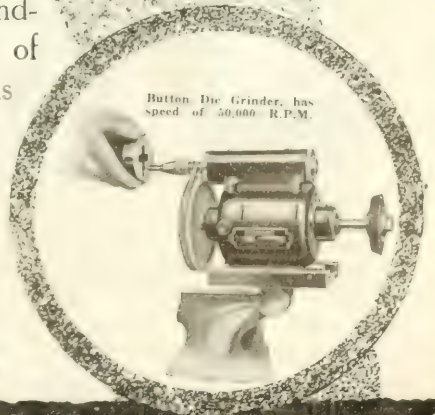




The high speed gives even the smallest of emery wheels the correct cutting speed and prevents them from breaking down. Your work will be entirely free from chatter marks, taper or bell mouth if you use DUMORE Grinders.

DUMORE PORTABLE ELECTRIC GRINDER

is being used in hundreds of shops for grinding tools, dies and gages, and on scores of similar jobs where extreme accuracy is essential.



Let us send you a DUMORE Grinder on approval. That's the way they are sold. Operates on both direct and alternating current. When ordering state voltage of your current.

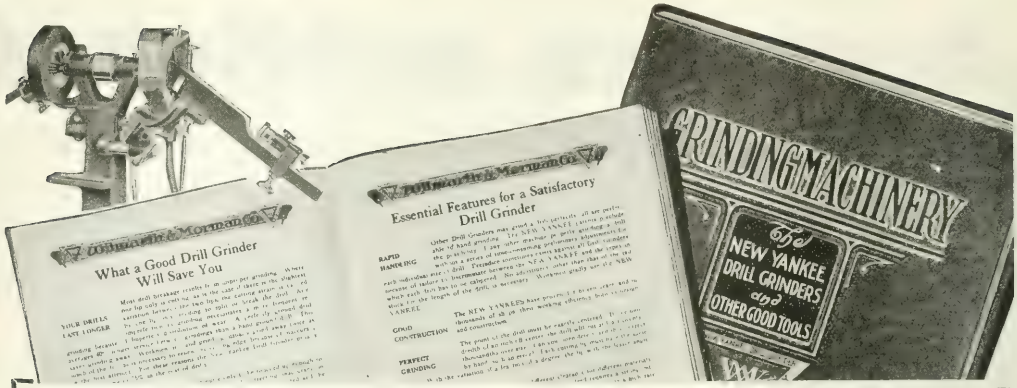
Write for illustrated literature.

Wisconsin Electric Company

1716 Dumore Building **Racine, Wis.**

Sold in England by Canadian-American Mchy. Co., Ltd., 5 Bouverie St., London, E.C., England.

If any advertisement interests you, tear it out now and place with letters to be answered.


What a Good Drill Grinder Will Save You
Essential Features for a Satisfactory Drill Grinder
GRINDING MACHINERY
The NEW YANKEE DRILL GRINDERS and OTHER GOOD TOOLS

10,000 New Yankee Drill Grinders

ARE SAVING

MILLIONS OF DOLLARS

For Their Users

Catalog No. 107 describes 100 styles and sizes of New Yankee Drill Grinders. Also W. & M. Surface Grinders and Universal Cutter and Tool Grinders. **It's free. Sign and mail coupon now.**

WILMARTH & MORMAN CO.

1200 Monroe Ave., N. W., Grand Rapids, Michigan, U.S.A.

Also Manufacturers of Surface and Universal Grinders

Wilmarth & Morman Co.,
1200 Monroe Ave. N. W.
Grand Rapids, Mich.

Gentlemen:

Please mail Catalog No. 107 and advise regarding New Yankee to meet our requirements.

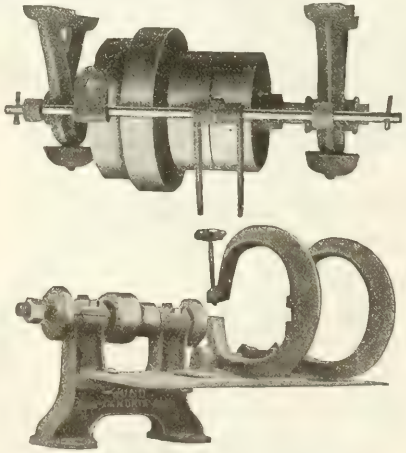
Our drills range from..... to.....

Name .....

Firm .....

Address..... Prov.....

BOND ADJUSTABLE SKATE SHARPENER



Suitable for 8 inch Emery Wheels

Babbitted and Reamed Bearings

Unnecessary to Remove Skates from Boots

Write for full information

Canadian Bond Hanger & Coupling Co., Ltd.

Alexandria, Ontario

Carry Your Grinder to the Work Not Your Work to the Grinder

Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)

No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave. E.; Vancouver: 1142 Homer Street

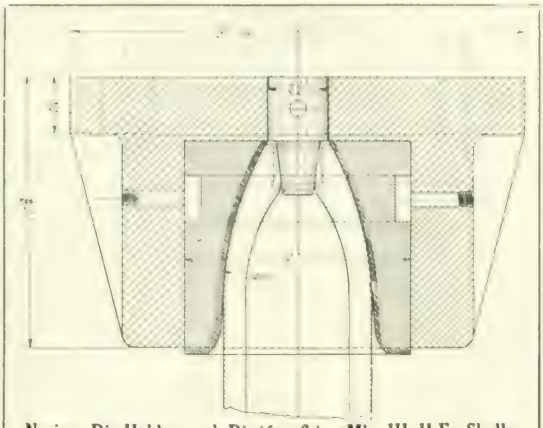
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Why Are Over 50 Shell Factories

in Canada and the United States using our

Nosing Dies & Holders?

BECAUSE our experience of a quarter of a century in making Car Wheels, Crusher Jaws, etc., of special Chilling Iron Mixtures enables us to produce just the right mixture for each size of Die, consequently



Nosing Die-Holder and Die for 6-in. Mk. III H.E. Shells.

They are made right, and chilled to the right depth to give long life, without being too brittle. Nearly 2,000 have now been made to the satisfaction of the users. Are you one of them? Made for 4.5", 5", and 6" H.E. shells.

MARSH & HENTHORN, LIMITED

BELLEVILLE, ONTARIO

Keep Your Grinding Wheels in Trim---

The Diamo-Carbo Emery Wheel Dressrs

The Diamo-Carbo Dresser [illegible] being very generally adopted as a substitute for the expensive diamond. Diamonds are becoming more scarce and quality is deteriorating. The quality of the Diamo-Carbo is uniform and in most places will do the same work as a diamond. They can be tried at our expense.

The Desmond Huntington No. 2 is the best dresser ever devised for use on large and coarse wheels.

We can make prompt deliveries of any type of Dresser desired.

THE CANADIAN DESMOND-STEPHAN MFG. CO.
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Eng.
Agent for Great Britain

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

"WELLS" UNIVERSAL GRINDER

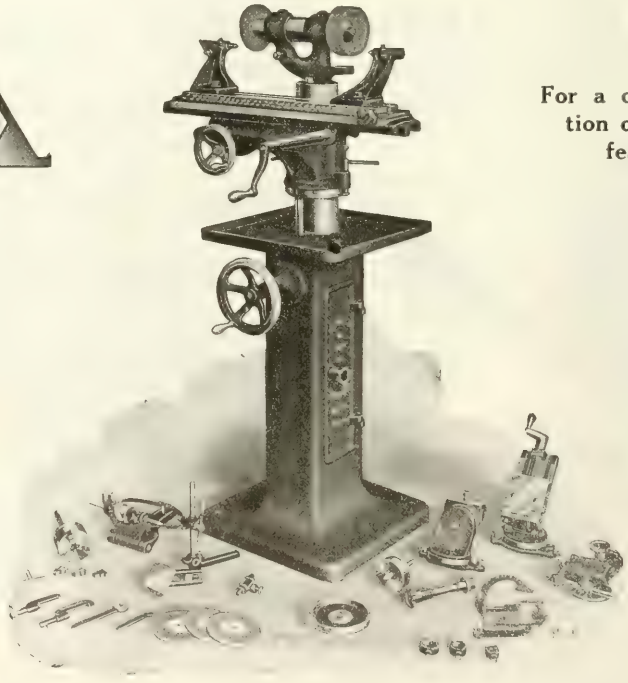
is pretty sure to meet your requirements at a lower cost than does the machine you are now using. This Universal Grinder is the only low-priced machine having a swivel table with vertical adjustment, making possible the use of cup wheels. It is designed for grinding all ordinary sized tools. At a low price your every want is filled by this practical day-after-day-job machine.

Seven combinations of attachments enable the machine to meet the needs of every particular job.

By means of the Wells Locking Device the table may be raised or lowered at any angle without changing position.

Then, too, you can find no higher grade machine with regard to workmanship, accuracy and finish.

We will be pleased to tell the full story. Send us your questions.



For a complete description of its important features write to-day.

Machinery Division

Greenfield Tap and Die Corporation

GREENFIELD, MASS., U.S.A.

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

Main Office and Works:
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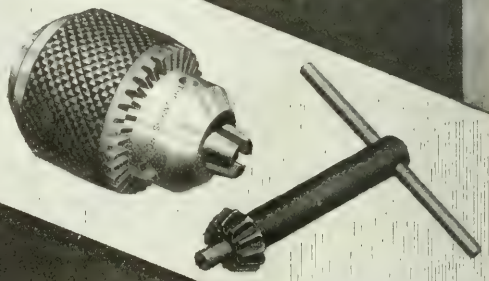
Jacobs
IMPROVED
Drill Chuck

A
Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

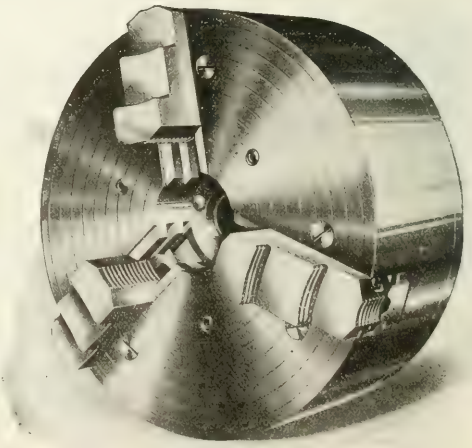
MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Think of it——
A 20 to 90% Increase in Production

THE M. E. C. Three-Jaw Air-operated Chuck shown herewith eliminates the waste usually experienced in ordinary chucking processes. It takes all classes of work of the hand-operated chuck, but grips much better and gives top-notch service day in and day out. Only the best materials obtainable go into its manufacture. It is made entirely of steel, including the body. A special process steel is used in making the actuating levers and all parts subjected to strain. The M.E.C. Three-jaw Chuck will do good work long after others have been discarded. Take it on thirty days' free trial.

Write for catalog on all M.E.C. Labor-Saving Devices.



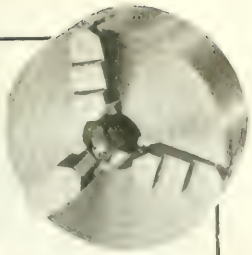
Manufacturers Equipment Co.

171 North Jefferson Street, Chicago, Ill.

Also makers of M. E. C. Two and Three-Jaw Air-Operated Chucks, Expanding Mandrels and Collapsible Taps

CANADIAN AGENTS:

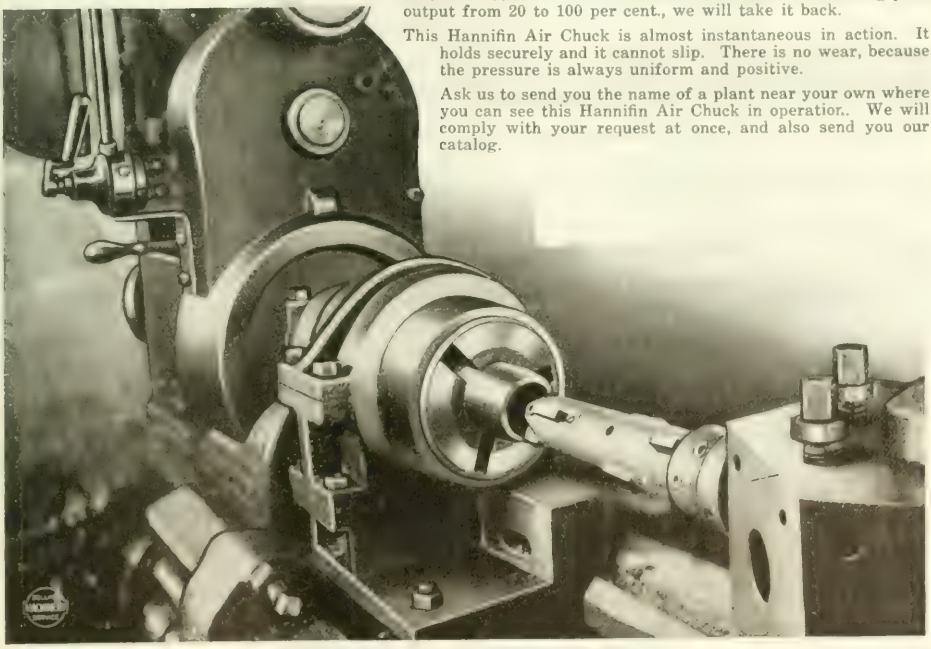
J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.



Order on Trial Let it Prove its Own Case—You the Judge

If we are over-optimistic, it is because we have never seen a Hannifin Chuck fail. On the other hand, in American and Canadian plants too numerous to mention here, we have seen the Hannifin Chuck increase output from 20 to 100 per cent. So we say to you: Order on trial

This HANNIFIN Air Chuck



If it does not save labor and time to the extent of increasing your output from 20 to 100 per cent., we will take it back.

This Hannifin Air Chuck is almost instantaneous in action. It holds securely and it cannot slip. There is no wear, because the pressure is always uniform and positive.

Ask us to send you the name of a plant near your own where you can see this Hannifin Air Chuck in operation. We will comply with your request at once, and also send you our catalog.

Hannifin Manufacturing Company

Chicago

U.S.A.

Representatives: The Canadian Fairbanks-Morse Co., Montreal; Knox-Andresen Co., Empire Bldg., Pittsburg, Pa. European Representatives: Coats Machine Tool Co., London; Fenwick, Freres & Co., Paris; Iznosskoff & Co., Petrograd.

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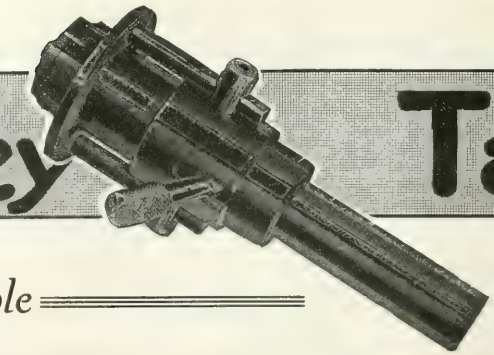
Murchey Taps



They are Collapsible

The only time they don't collapse or bend is under strain of heavy work and when in action. But for speedy adjustment, convenient, quick-acting operation, the collapsible and adjusting features stand prominently in the foreground.
The chasers are adjustable to compensate for any wear, and this feature enables the tap to maintain its minute accuracy, and adds to its general dependability.

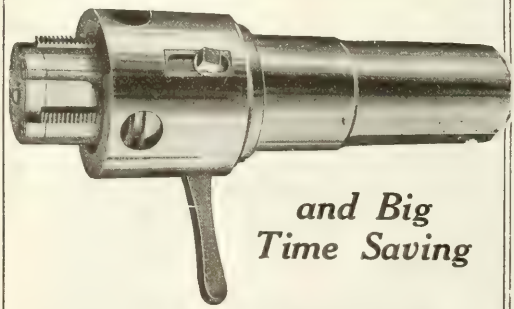
The records performed by Murchey Taps on munitions work is equally prominent in general lines. They are built for service, and they give it.

We maintain a special chaser service for our clients that enable them to renew chasers at the minimum cost. Inquire immediately. Quick action means quick solution to your troubles.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England.
Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.

Murchey Machine & Tool Co., 75 Porter Street, Detroit, Mich.

For Positive Accuracy—

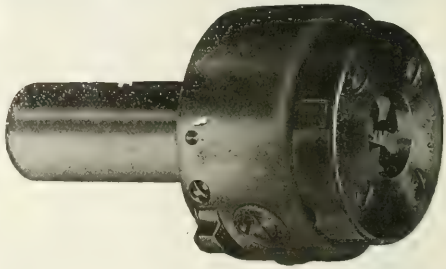


and Big Time Saving

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features and others make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

VICTOR Collapsible TAPS

Victor Tool Company
Waynesboro, Pa., U.S.A.



Desirable Threads

Are easily obtainable with an H. & G. Automatic Self-opening Die Head.
The Chasers are set and held in place by a steel cam which, once adjusted, locks. No stopping or changing required to keep to size. There are a good many other features on this Die Head.

"Write us!—write now."

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H & G

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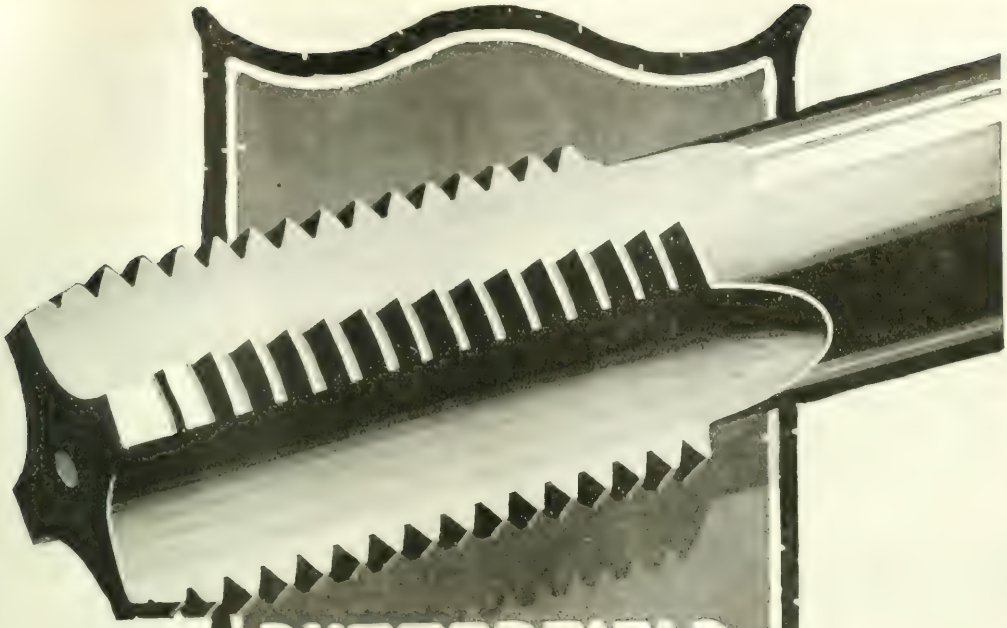

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The name that means *quality* and *service*.

Butterfield Taps, Dies and Reamers are the finest development of many years' experience in tool making. Material design, workmanship—every detail is correct.

For the minimum of wear and breakage—Butterfield Tools.

Catalog No. 18 on request.

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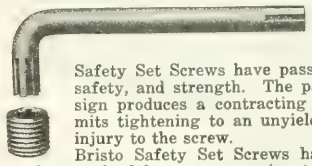

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Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

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"Maintenance of Quality"

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Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

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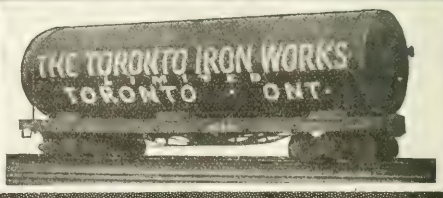

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Union Tool Chest Works
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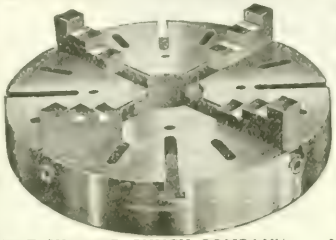
Skinner Independent Chucks

FOR HIGH SPEED WORK
IRON OR STEEL BODY



The last word in chuck construction. With jaws hardened steel thrust bearings, adjusting screws of large diameter, threaded full length. Jaws ground after hardening, etc.

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Combined Jaw and Friction. Friction only.
Gas Engine Clutches. Jaw Clutches.
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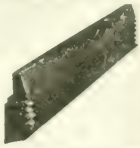

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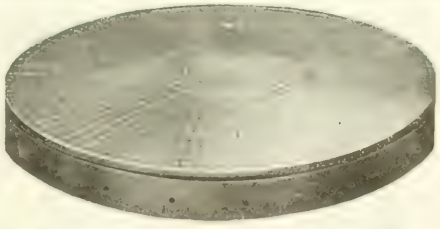

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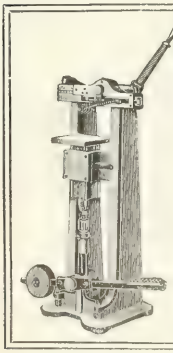

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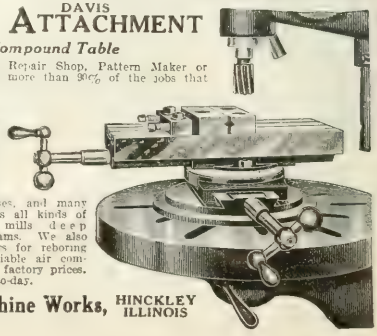
For the Die Maker, Repair Shop, Pattern Maker or Garage; will perform more than 90% of the jobs that come up.



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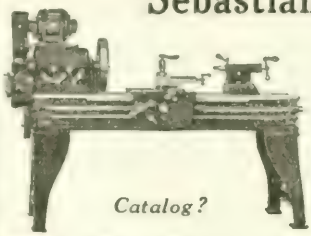

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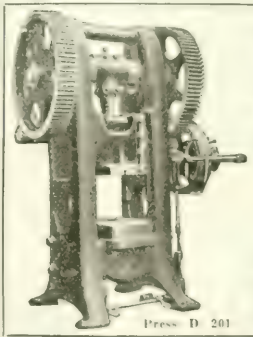

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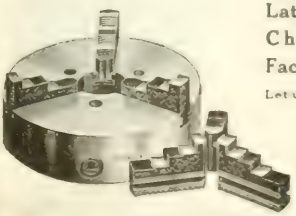

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Hartford, Conn., U.S.A.

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"Frost King" is a flawless babbitt, pleasing to the most exacting and critical mechanics, for the way in which it takes care of high speed under heavy demands.
When you want the perfect, all-round babbitt, use "Frost King." It will lessen your babbitt expenses. Try it and be convinced.

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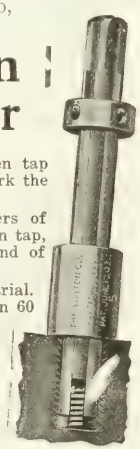
3 Minutes to back it out

Not a fraction of an inch to grip, and you must not injure the thread. Even so,

The Walton Tap Extractor



in your hands will back out this broken tap in three minutes and not so much as mark the threads.

You simply drop its strong, slim fingers of crucible steel into the flutes of the broken tap, apply a wrench to the squared outer end of the Extractor—and turn.

Take this Walton Tap Extractor on trial. If it doesn't more than pay for itself in 60 days, send it back.

Write to-day for descriptive circular.

The Walton Co.

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What Are You Doing With It?

A big *economy* or a big *waste?*
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Which is it in your plant?

Are you returning the condensation in your steam lines *immediately* back to the boilers as pure hot feed water—or are you allowing it to clog up your apparatus and slow down the operation of your plant.

The thousands of concerns—both large and small—who use the

Morehead Back to Boiler SYSTEM

turn the water of condensation right back to the boilers at from 270 to 312 Degrees F.—save from 8% to 10% in coal over the wasteful steam pump—and at the same time keep every inch of heating surface on their equipment working at the highest possible thermal efficiency.

If you are still depending upon steam pumps or other makeshifts for handling the condensation in your plant you can convert a big loss into a big saving by investigating the Morehead System at once. For complete particulars address.

CANADIAN MOREHEAD MFG., CO.

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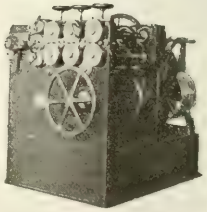
The Machines that put the "Rings" in Springs!



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Prest-O-Lite Co., Inc., Toronto, Ont.

ACCUMULATORS, HYDRAULIC
Canadian Fairbanks-Morse Co., Montreal
Charles F. Elmes Eng. Works, Chicago
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Smart-Turner Mach. Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto

ADAPTER PLATES
The McKay Co., Pittsburgh, Pa.

AIR RECEIVERS
Can. Ingersoll Rand Co., Sherbrooke, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

AIR WASHERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

ALUMINUM
Canada Metal Co., Toronto
Tallman Brass & Metal Co., Hamilton

ALLOY, STEEL
Can. B. K. Morton, Toronto, Montreal
H. A. Intery Co., Montreal
Hawksbridge Brass Co., Boston, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Hartford, Conn.

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
McClean & Son, F. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Hartford, Conn.
Rockford Machine & Tool Co., Toronto, Can.
A. R. Williams Machy. Co., Toronto

BABBITT METAL
Aikenhead Hardware Co., Toronto, Ont.
Baxter & Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Ltd., Toronto
Can. B. K. Morton, Toronto, Montreal
Foss & Hill Machy. Co., Montreal
Hoyt Metal Co., Toronto
Magnolia Metal Co., Montreal
Petrie, Ltd., H. W., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton
Wilkinson & Kompass, Hamilton, Ont.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal
Can. S. K. F. Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Charles F. Elmes Eng. Works, Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York

BASE PLATES
Jas. McKay Co., Pittsburgh, Pa.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT DRESSING AND CEMENT
Baxter & Co., Ltd., J. R., Montreal, Que.

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, BALATA
Baxter Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal
Federal Engineering Co., Toronto, Ont.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
Goodyear Tire & Rubber Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter & Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

BENDING MACHINERY
John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. R. & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Scott Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

BILLET MARKERS
Williams & Orr, Ltd., H., Pittsburgh, Pa.

BINS, STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Crane Mfg. Co., Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.
U. S. Silica Co., Chicago, Ill.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mulliner Ferland Tool Co., Syracuse, N.Y.

BOARTZ
Erasmus & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
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Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

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Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

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Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
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Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
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Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

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Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

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John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Emmert, Ira, 28 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

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Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

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Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
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Petrie, Ltd., H. W., Toronto, Ont.
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Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTRACT WORK
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Niles-Bement-Pond Co., New York.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerville.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Brown, Boggs Co., Hamilton, Ont.
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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
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Wells Brothers of Canada, Galt, Ont.

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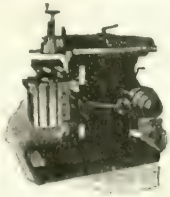

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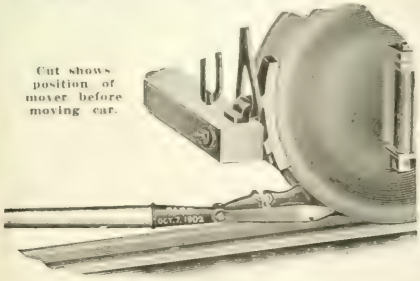

Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

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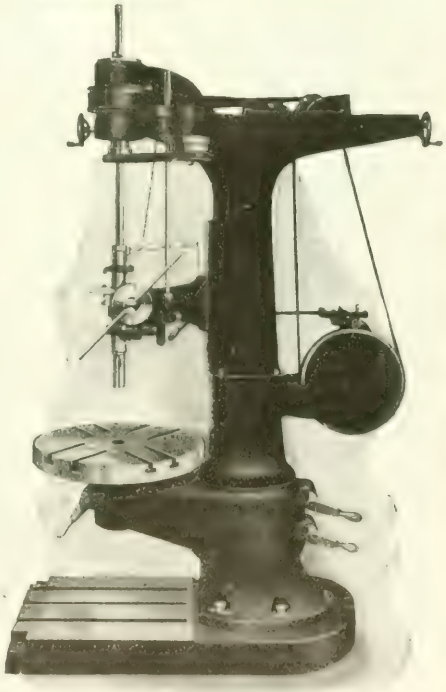

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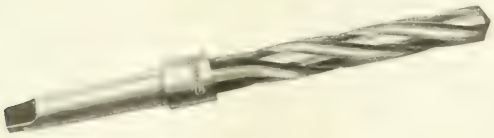

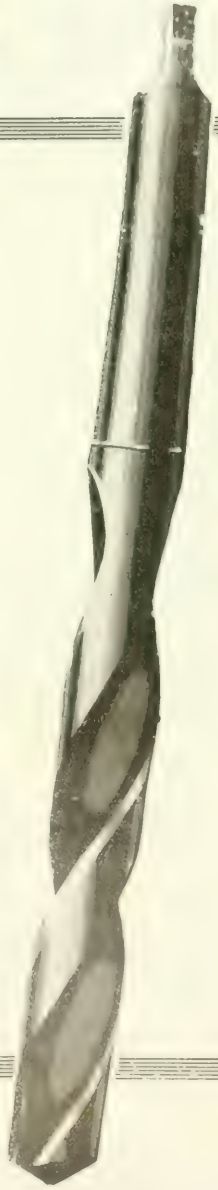

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Garlock-Walker Machinery Co., Toronto, Ont.
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Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NOSE SOCKETS
Jas. McKay Co., Pittsburgh, Pa.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

PACKINGS, ASBESTOS
Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont

PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

PATENT SOLICITORS
Bidden, Hanbury, A., Montreal
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PATTERNS
Winnipeg Gear & Engr. Co., Winnipeg, Man.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

PIPE RIVETED STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.

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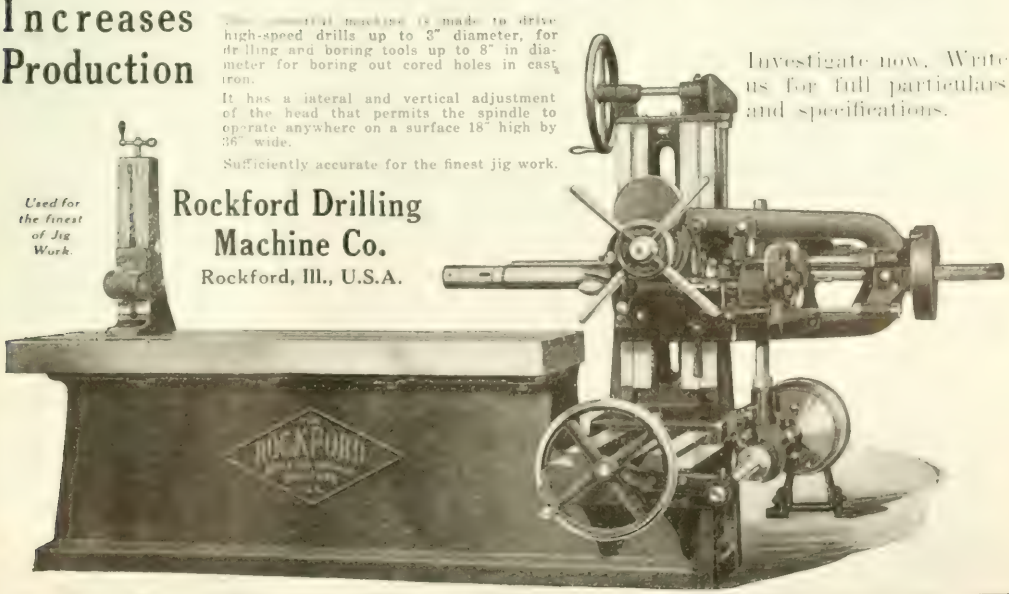

Rockford Drilling Machine Co.

Rockford, Ill., U.S.A.

PRESSES, BALING
William R. Perrin, Ltd., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, SCREW
Barnes, W. F., & John, Co., Rockford, Ill.
Bliss Co., E. W., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
William R. Perrin, Ltd., Toronto.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Mach. Co., Bridgeton, N.J.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound, Ont.

PULLEYS
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PULLEYS, FRICTION CLUTCH
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Ltd., Toronto.

PULLEY MACHINERY, DRILLING AND TAPPING
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Wells Bros. of Canada, Galt, Ont.

PUMPS, AIR
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Smart-Turner Mach. Co., Hamilton.

PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto, Ont
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

PUMPS, FUEL OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

PUMPS, HIGH PRESSURE
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.

PUMPS, ALL KINDS
Blake Pump & Condenser Co., Fitchburg, Mass.
Can. Blower & Forge Co., Kitchener, Ont.
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PUMPS, HYDRAULIC
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Smart-Turner Mach. Co., Hamilton.
William R. Perrin, Ltd., Toronto.

PUMPS, LUBRICANT, OIL
Bellevue Industrial Furnace Co., Detroit, Mich.
Bowser & Co., Inc., S. F., Toronto, Ont.
Roper, C. F., Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

PUMP LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.

PUMPS, ROTARY, POWER DRIVEN
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

PUNCHES, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

PURIFYING AND SOFTENING APPARATUS
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.

PYROMETERS
Bellevue Industrial Furnace Co., Detroit, Mich.
Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.

QUARTERING MACHINES
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS (SEE GUARDS)

RAIL BENDERS
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.

RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, ADJUUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio

RIVET MACHINES
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

ROLLS, CRUSHING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland

RULES
Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co,, Cleveland, Ohio.

SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.

SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto

SAWS, CIRCULAR METAL
Hunter Saw & Machine Co., Pittsburg, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.

SCREW MACHINE PARTS
Johnson Mach. Co., Carlyle, Manchester, Conn.

SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.

SCREWS
Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.

SECOND-HAND MACHINERY
Davis Machine Tool Co., W. F., New York
Dominion Machinery Co., Toronto
Foss & Hill Machy. Co., Montreal
Hill, Clarke & Co., Chicago, Ill.
McCabe, J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
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Can. Drawn Steel Co., Hamilton, Ont.
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Niles-Bement-Pond Co., New York
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Escaped from Germany

AN escaped prisoner tells the story of his fearful experiences in Germany in MACLEAN'S MAGAZINE for November; and gives a vivid picture of conditions in Germany as he saw them. He got out by way of Holland after appalling perils and hardships. In Holland, he was photographed, but so altered was he that his wife quite failed to recognize him in this photograph. Read this story of this Canadian soldier's escape. It is gripping stuff—a rare tale.

Canadian Finances After the War

WILL business in Canada collapse when peace comes? It may. What do the big men say? What do they know? What do you think? Are your opinions well informed? The subject is of the greatest possible importance, and you will get light and leading by reading the contribution of Col. John Bayne Maclean, who has taken the trouble to get the opinion of the biggest and most highly placed men in Canada to help him prepare his article.

Back from the Arctic

WILLIAM THOMPSON, representing the American Geographical Society, was this year in the Arctic Regions. He went to the delta of the Mackenzie River, and took many excellent pictures of the country and its Eskimo inhabitants. He makes the November MACLEAN'S the vehicle of many of his pictures and for an account of his journey. Read what this Arctic scientist has to tell us about a remote part of our land.

Slackers and Conscription

WHAT is your attitude towards the draft? You have positive opinions, of course. How do they square with Miss Laut's as they are expressed in her ringing article on Slackers in the November MACLEAN'S?

The Nation's Business

THIS is a new feature—a fearless, well-informed survey of national affairs. What we all want is an outspoken—but not vindictive—and clear-visioned presentation of factors and facts affecting our national, political and economic welfare.

Sketches of Trench Life

By Gunner McRitchie

MCRITCHIE was a cartoonist on a Western Canada daily before he went overseas. He has done a number of sketches of trench life "On the Spot," and these he has sent home, for publication in MACLEAN'S MAGAZINE. They're interesting and good.

The Late Sir Mortimer Clark

BEFORE he died, a few weeks ago, the late Sir Mortimer Clark, eminent jurist and an ex-Lieutenant-Governor of Ontario, wrote for MACLEAN'S an article on "Safeguarding Your Heirs." It has to do with the functions, service and safety of Trust Companies as executors of estates. This article by a man so distinguished, so cautious, so able, and so wise a counsellor, can be of first-rate value to every man perplexed with the problem of how his estate can be safely and prudently administered after he, the testator, has passed from this life.

A Complete Novelette

By Peter B. Kyne

HIS story in the November MACLEAN'S is a thunderingly good story of lumbermen and lumbering. Red blood is in this tale of business. R. M. Brinkerhoff illustrates it.

Short Story

By Ethel Watts Mumford

THE writer of this short story—the first of a delightful series by this author to appear in MACLEAN'S—is very well known among short story writers. Delicate fancy, wholesomeness, freshness and finished workmanship characterize all her work.

Short Story

By W. A. Fraser

A MIGHTILY well-written story of India—the kind that we all delight in; tense, bewildering, and lots of action. Fraser never wrote a better short story than this. Ben Ward illustrates it.

Hendryx and Oppenheim

SERIALISTS

"THE Gun Brand," by Hendryx, comes to an end in the November issue. Oppenheim's greatest story, "The Pawns Count," is continued. Oppenheim's story is the biggest single feature ever secured by MACLEAN'S.

MACLEAN'S MAGAZINE

for November At All News Dealers **15c.**

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Landis Machine Co., Waynesboro, Pa.
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Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.

[illegible] Mass.
[illegible] Pa.
[illegible]

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[illegible] Tool Co., Chicago, Ill
[illegible] N.Y.
[illegible]

TOOLS, PNEUMATIC
[illegible]-Rand Co., [illegible]
[illegible]
[illegible]

TOOLS, LATHE, PLANER, SLOTTER
[illegible]

TOOLS, SCREW MACHINE
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[illegible] Walkerville
[illegible]

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[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

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[illegible]
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[illegible]
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VALVE GRINDERS (PNEUMATIC)
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[illegible]
[illegible]
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[illegible]

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[illegible]

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[illegible]

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National Machy. Co., Tiffin, Ohio.
[illegible]
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[illegible]

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Garlock-Walker Machinery Co., Toronto, Ont.
[illegible]
Sleeper & Hartley, Inc., Worcester, Mass.

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[illegible]
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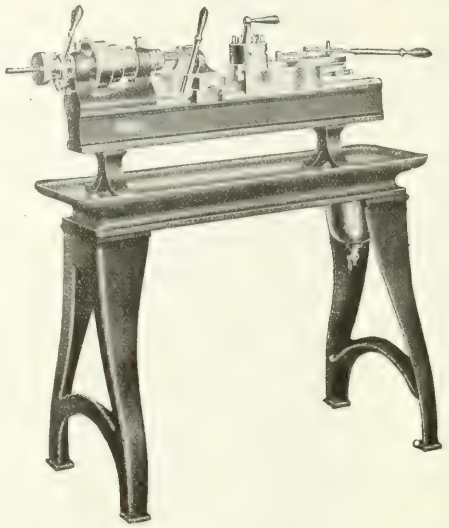

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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, NOVEMBER 1, 1917 No. 18

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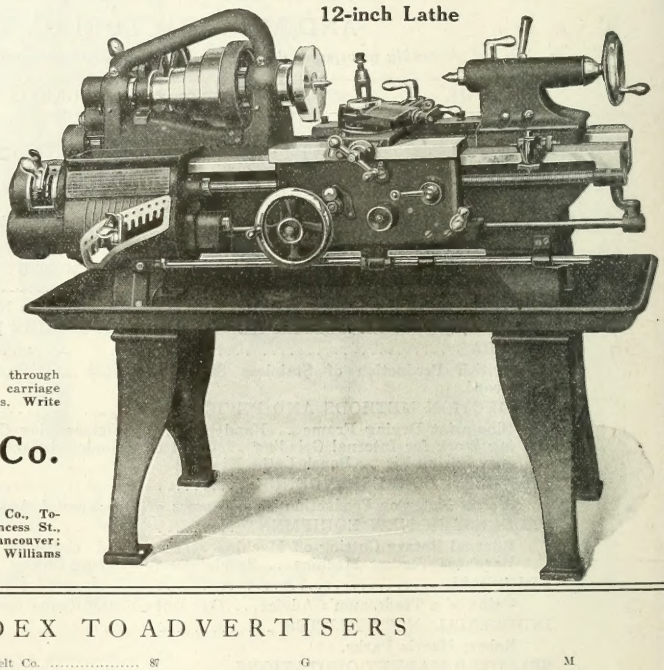

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6″ Light
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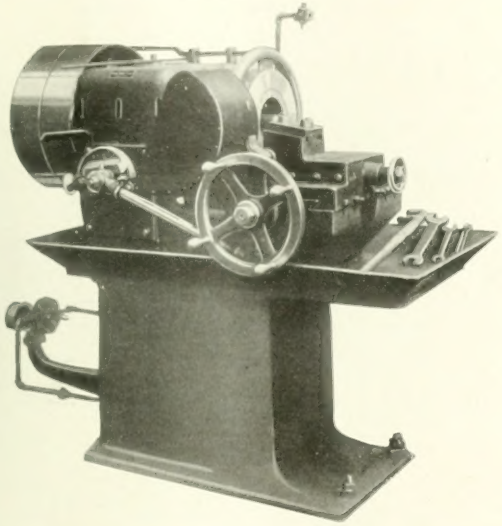
Machine



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